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DURING THE

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35TH CONGRESS, 2d Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 2.

MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES

TO THE

TWO HOUSES OF CONGRESS

AT THE

COMMENCEMENT OF THE SECOND SESSION

OF

THE THIRTY-FIFTH CONGRESS.

DECEMBER 6, 1858.—Read, and committed to a Committee of the Whole on the state of the Union, and, together with the accompanying documents, ordered to be printed.

DECEMBER 11, 1858.—*Resolved*, That there be printed, for the use of the members of the House of Representatives, twenty thousand extra copies of the message of the President of the United States, together with the accompanying documents.

3.

VOLUME II—PART II.

WASHINGTON:
JAMES B STEEDMAN, PRINTER
1858.

REPORT

OF THE

SECRETARY OF WAR,

CONTINUED.

WASHINGTON, D. C., *January* 31, 1858.

SIR: I submit a report of the most important cases of sickness ths required medical treatment in the party under your command, fro June 15 until December 4, 1857.

After the party reached the Loup Fork it was necessary to remai in camp for a number of days awaiting the arrival of the escort. Th mouth of that stream was reached July 4, and we encamped near th river not far from the town of Columbus. It was in this locality ths the most serious cases of illness which occurred in the party wer generated. In passing up the Platte we travelled principally at som distance from the stream. Near the river, and along some of it tributaries, swampy districts of country exist which might endange the health of persons living in their vicinity during the summer an autumn. I noticed long marshy tracts of this kind overgrown wit heavy vegetation along the Loup Fork at this point. Soon after ou encampment a good deal of bilious derangement prevailed in the party and the presence of miasmatic poisons was soon made apparent in th occurrence of a number of cases of intermittent fever. Nearly all o the party experienced unpleasant disturbances of health here. Th season had been unusually wet and the heat was extreme. Vege tation was consequently developed very rapidly, and it was, therefore not difficult to account for the early appearance of disease among us Under ordinary circumstances I would consider this region as health as most prairies, but the past seasons were particularly favorable t the development of malaria. All of the cases, however, that wer treated here yielded readily, and when we commenced our journey u the Loup Fork no complaint was heard.

We seemed, however, peculiarly unfortunate in the start; for, few days after we had got finally under way, the most serious case o sickness which we had to encounter during the trip commenced. O July 23, May, a teamster, exhibited the symtoms of fever, and it soo became apparent that this man must suffer a long and severe illness under the most favorable circumstances his chances for recovery woul have been considered few, and the circumstances under which we wer of necessity placed tended greatly to diminish those chances. Dela was out of the question, as his case, if it resulted favorably, woul require at least a fortnight, and we therefore placed him in the bes situation that was possible in travelling and did all in our power t promote his recovery. This case was an interesting one to the medi cal practitioner; it was one of those in which the signs and sympton of typhoid and of remittent bilious fevers were intimately blended Delirium commenced early, with stupor, diarrhœa, and that peculia condition of the tongue and mouth noticed in typhoid fever; with thes some of the common symptons of remittent fever were exhibited, an although the attack could not be cut short by quinia, its violenc was greatly modified by that agent. The sickness of this ma embarrassed our progress seriously, but after nearly three weeks o trouble and anxiety with his case we were gratified to note his con valescence. A halt of three days during the most excited period o his disease tended greatly to promote a favorable termination. Ma

was hauled the entire distance to Fort Laramie, not being able to perform any duty until we reached that point. On the 8th of August I was attacked with bilious remittent fever myself, and can testify from experience to the inconvenience from being sick on the prairies. My attack was not severe, and yielded in eight or ten days. These and the cases of intermittent were the only cases of fever that occurred in the party during the season.

The country through which we passed up to this point was along the Loup Fork. That portion of it most favorable to the production of fever is near its mouth; as you approach the sources of the river there are fewer wet tracts near the stream, and the country generally is not so flat. I notice the marshes particularly, as that is the only condition observed which could interfere with the health of the population if the country were inhabited. These are not numerous after you leave the mouth of the river some distance, and there is nothing to warrant the inference that the country is not highly favorable to health.

Indeed, in most respects, this region, so far as health is concerned, may be considered as highly favored. As you approach the elevated regions near the mountains the atmosphere is exceedingly dry and pure. Much has been said of the favorable effects of a residence in this region upon persons laboring under pulmonary diseases. As this far western region becomes more generally known, I think the subject will attract greater attention. I think the rational explanation of the improvement in consumptive cases that has been noted in this quarter is found in the dryness of the atmosphere. Sudden changes of temperature here, if not less frequent than in some of our eastern States, are certainly not productive of the same bad consequences to the invalid. The lungs of those who are suffering with phthisis are here free from that constant irritation to which they are subjected in an atmosphere loaded with moisture. And the feeling of buoyancy and strength that is imparted encourages the invalid to make new exertions to promote recovery. A residence in such an atmosphere, combined with habits of active exercise, and constant living in the open air, might, in some cases I am sure, be productive of the best results. An intelligent friend, now residing at Fort Laramie, informed me that in his youth he was attacked with phthisis, that horrible disease being hereditary in his family; he was rapidly declining, and went to this far western region in the hope that the climate might prove beneficial; he made his home amongst the wandering bands of Indians, and avoided none of the exposure incident to such a life; he laid constantly in the open air and took as much exercise as possible; his health improved, and in a year or two he was entirely restored, and is now residing at Fort Laramie a strong and healthy man. I have heard of many other cases similarly restored. In New Mexico consumption is unknown, I am informed, as a disease originating in the country where the climate has the additional advantage of being warm.

During the extremely hot weather that continued during our journey up the Loup Fork, our party suffered very little with diarrhœa or dysentery. A number of cases of the former occurred, but only a few required any treatment, and but a single case of dysentery, which

was mild. After reaching Fort Laramie those who had been sick rapidly recovered, and when we left that post all of the party were in excellent health.

During the fine weather that continued for a few weeks in the beginning of the fall no cases of sickness occurred. In October the weather became inclement, and was very cold and wet. During our trip down the Niobrara no complaint was heard, except in some chronic cases, which were somewhat aggravated by the bad weather and exposure, and when the party reached Fort Randall all were in good health. Several of the soldiers had suffered from scurvy during the summer, these improved during the trip down the Niobrara, along which stream we found an abundance of plums and grapes. After leaving Fort Randall (November 7th) the members of the party were attacked with influenza, and this disease prevailed during the entire trip from Randall to Leavenworth, and only four or five members of the party escaped an attack. Some of the men, who were much exposed to the inclement weather that we experienced on the trip, suffered severely, and at times a sufficient number were not off of the sick list to carry on the train properly. All recovered, however, and when we reached Leavenworth the party was in good health. Below is an enumeration of the most important cases treated during the season. Many trifling cases occurred of which no note was taken.

Diseases.	No. cases.	Results.
Intermittent fever	5	Recovered.
Bilious remittent	2	Recovered.
Diarrhea	5	Recovered.
Dysentery	1	Recovered.
Gonorrhea acute	3	Recovered.
Orchites	1	Recovered.
Gleet	3	Recovered.
Chronic cystitis	1	Recovered.
Diabetes	1	Improved.
Granular confuncteritis	1	Improved.
Tarsal opthalmia	1	Recovered.
Influenza	11	Recovered.

Respectfully,

SAMUEL H. MOFFITT,
Physician to expedition.

Lieutenant G. K. WARREN,
Topographical Engineers.

WASHINGTON, D. C., *November* 28, 1858.

SIR: In compliance with your request I have prepared a catalogue of the collections in geology and natural history, obtained in Nebraska and portions of Kansas, during several expeditions to those Territories under your command.

The list cannot be made out at this time as complete as could be desired, but it will be at once evident to all that the amount of new and valuable material thus secured, will, when properly studied and illustrated, form a large and positive addition to science. Of the fossil mollusca collected most of the new species have been indicated in scientific journals by my associate, Mr. Meek, and myself, and about seven hundred figures prepared, making, when arranged for the engraver, about fifty quarto plates. The fossil plants from cretaceous formation No. 1 will also be included in the volume, and consist of eighteen species, all of which are supposed to be new to science. The fossil plants of the tertiary era, of which there is a large series, remarkably well preserved and of great beauty, have not yet been studied to any extent. We simply know that they comprise about fifty species, all of which are supposed to be new, and would alone form a good-sized quarto volume. Descriptions and suitable illustrations of these plants will be made during the winter or spring.

The fossil mollusca are arranged in their stratigraphical order, thus bringing at once before the geologist the characteristic fossils of each formation known in the northwest, from the carboniferous to the tertiary, inclusive. The work will thus form a standard of reference for those who may wish to study the geology of the west, and will enable the explorer, even though but moderately versed in the science, to determine the age of the formations over which he may be travelling. The fossil vertebrata, which are very numerous in species, a large proportion of which were entirely new to science, have been placed in the hands of Dr. Leidy, the great comparative anatomist of Philadelphia, who informs us that the drawings are nearly ready for the engraver.

The following is a list of the memoirs already published in the transactions of scientific societies on the geology and paleontology of Nebraska and Kansas, by F. B. Meek and F. V. Hayden.

1. Descriptions of sixty-three new species of *Acephala*, *Gasteropoda* and *Cephalopoda* from the cretaceous formation of Nebraska Territory.—(Proceedings of the Academy of Natural Sciences, Philadelphia, March, 1856, p. 16.)

2. Descriptions of new species of *Acephala* and *Gasteropoda* from the tertiary formations of Nebraska Territory, with some general remarks on the geology of the country about the sources of the Missouri river.—(Proc. Acad. Nat. Sci. Pa., June, 1856, p. 16.)

3. Descriptions of new fossil species of mollusca, collected by Dr. F. V. Hayden in Nebraska Territory, together with a complete catalogue of all the remains of *invertebrata* hitherto described and identified from the cretaceous and tertiary formations of that region.—(Proc. Acad. Nat. Sci. Pa., November, 1856, p. 22.)

4. Descriptions of new species and genera of fossils collected by Dr. F. V. Hayden in Nebraska Territory, under the direction of Lieut. G. K. Warren, U. S. Topographical Engineers, with some remarks on the tertiary and cretaceous formations of the northwest, and the parallelism of the latter with those of other portions of the United States and Territories. Communicated by permission of the Secretary of War.—(Proc. Acad. Nat. Sci. Pa., May, 1857, p. 34.)

5. Descriptions of new organic remains from northeastern Kansas, indicating the existence of permian rocks in that Territory.—(Transaction of the Albany Institute, vol. IV—read March 2, 1858.)

6. Descriptions of new organic remains collected in Nebraska Territory in the year 1857, by Dr. F. V. Hayden, geologist to the exploring expedition under the command of Lieut. G. K. Warren, Topographical Engineers, U. S. A., together with some remarks on the geology of the Black Hills and portions of the surrounding country.—(Proc. Acad. Nat. Sci. Pa., March, 1858, p. 19.)

By F. V. HAYDEN:

7. Notes explanatory of a map and section, illustrating the geological structure of the country bordering on the Missouri river, from the mouth of the Platte to Fort Benton in latitude 47° 30′ N., longitude 110° 30′ W.—(Proc. Acad. Nat. Sci., Pa., May, 1857, p. 10.)

8. Notes on the geology of the Mauvaises Terres of White river.—(Proc. Acad. Nat. Sci., Pa., June, 1857, p. 8.)

9. Explanations of a second edition of a geological map of Nebraska and Kansas, based upon information obtained during an expedition to the Black Hills, under the command of Lieutenant G. K. Warren, topographical engineers, United States army.—(Proc. Acad. Nat. Sci., Pa., June, 1868, p. 22.)

Dr. Leidy's descriptions of the new *vertebrata*, collected from time to time, are distributed through various numbers of the proceedings of the Philadelphia Academy for the years 1856, 1857 and 1858. The principal paper was published in March last, and bears the following title: "Notice of remains of extinct *vertebrata* from the valley of the Niobrara river collected by Dr. F. V. Hayden, geologist to the expedition, under the command of Lieutenant G. K. Warren, topographical engineers, United States army, by Joseph Leidy, M. D." The details of the geology of the regions explored will be reserved for your final report.

The following is the number of species comprised in the collection from each department of natural history as far as they have been studied, up to this time. The catalogue includes none of the insects of which there are many species, nor the cryptogamic plants which have not yet been identified.

Number of species of fossil vertebrata	77
Number of species of fossil mollusca	251
Number of fossil plants	70
Number of minerals and geological specimens	423
Number of species of recent mammals	47
Number of species of birds	186
Number of species of recent mollusca	65
Number of species of fishes	24
Number of species of reptiles	28
Number of species of recent plants	1,500

Of the fossil mollusca named in this catalogue 186 species were new to science, upwards of 50 of the vertebrata and all the fossil plants are supposed to be new. A number of rare or entirely new species

were discovered in all departments of natural history. The specimens are now deposited in the museum of the Smithsonian Institution, and in behalf of the expedition I would return my grateful thanks to the distinguished Secretary of that Institution for the numerous facilities he has very kindly afforded for their investigation.

With high regard, I remain at your further service.

F. V. HAYDEN,
Geologist and Naturalist.

Lieutenant G. K. WARREN,
Topographical Engineers, U. S. A.

GEOLOGY AND PALEONTOLOGY.

In order to render this catalogue something more than a mere list of species, I have attempted to present a summary of the geological formations, as far as they are at present known, in Kansas and Nebraska. This will render more clear the geological relations of the fossils from the Potsdam sandstone to the pliocene tertiary.

The rocks of Nebraska, as far as they are at present known, are referrible to the following geological systems:

1. Metamorphosed azoic rocks, including coarse granite.
2. Lower Silurian. (Potsdam sandstone.)
3. Devonian.
4. Carboniferous.
5. Permian.
6. Jurassic.
7. Cretaceous, Upper, Middle and Lower (including Wealden?)
8. Tertiary.
9. Post Pliocene or Quaternary.

Passing over the granitic and azoic rocks, we find that the Potsdam sandstone or the lowest member of the silurian period is quite well developed in the Black Hills. It is there brought to the surface by the upheaval of the igneous rocks and forms a narrow belt around the most elevated portion of the Black Hills. This formation, though well known and studied in many parts of the United States, had not been discovered in the region of the Rocky mountains prior to Lieutenant Warren's exploration of the Black Hills, during the summer of 1857. So far as is yet understood, this member of the geological series has revealed the first indications of organic life on our planet. The following species of fossils, belonging to what Barrande, the great paleontologist of Bohemia, has called the "Primordial Fauna," have been identified from the Potsdam sandstone of the Black Hills and suitable illustrations prepared. *Lingula antiqua*, (Hall;) a species of *lingula* very similar to *L. prima*, (Conrad,) occurs in vast numbers, forming layers several inches in thickness; a species of *obolus*, very closely allied to *O. oppolinus*, as figured by Muchison and De Verneuil in their work on the geology of Russia, and fragments of a *trilobite*, apparently identical with one of the forms figured by Dr. Owen from the Potsdam sandstone of Minnesota.

The discovery of this formation in the far west is a matter of the highest geological interest, and its existence in the Black Hills being now well established, we may look for its discovery in many other parts of the west, and it will undoubtedly be found holding a similar position all along the eastern slope of the Rocky mountains.

No well marked fossils have yet been obtained from the supposed devonian period in Kansas or Nebraska, and its existence there is, with our present evidence, quite problematical.

A large collection of fossils was secured from the carboniferous group, in the Black Hills, near the Laramie range of mountains, in the southeastern portion of Nebraska, and in various parts of Kansas. A large and fine collection of carboniferous and permian fossils were collected by Mr. F. B. Meek and the writer, in Kansas, during the past summer. These fossils are now being investigated at the Smithsonian Institution. I will therefore omit a catalogue of the carboniferous fossils until our results are more complete. The organic remains from all the localities above mentioned, as well as from many other parts of the west and southwest, have several species in common, and the others are of the same types; so that the evidence seems to be conclusive that these limestones are all of the same geological age, and belong to the true coal measures.

One of the most interesting series of rocks in the west are best developed in Kansas, but most probably exist near the Black Hills also. These rocks were at first supposed to be the American representatives of the permian group of Europe; but much more study will be required to give them their exact position in the geological scale. A large collection of fossils from these rocks has been studied with considerable care by Mr. Meek and the writer, and they seem to warrant the conclusion that by far the greater portion of the strata of the so-called permian in the west hold an intermediate position between the carboniferous and the permian of the Old World. A thorough and clear solution of this problem becomes, therefore, the most interesting feature in American geology at the present time.*

The following species, most of which are of permian types, have been described by Mr. Meek and the writer, and published in the Transactions of the Albany Institute. The larger part of them were obtained by Mr. Hawn and Dr. Cooper in Kansas, and the remainder were collected by the writer in Nebraska, opposite the northern boundary of the State of Missouri, and in the Black Hills, while attached to Lieutenant Warren's party:

1. *Monotis Hawni;* Meek and Hayden.
2. *Myalina (Mytilus) perattenuatus;* Meek and Hayden.
3. *Bakevellia parva;* Meek and Hayden.
4. *Edmondia? Calhouni;* Meek and Hayden.
5. *Pleurophorus? occidentalis;* Meek and Hayden.

* The upper portion of the so-called permian in Kansas seems to be destitute of true carboniferous fossils, but contains an abundance of those belonging to permian types. We are therefore of the opinion that the upper two or three hundred feet of these rocks are probably on a parallel with the permian of Europe, and that the intermediate group which we have mentioned fills up the hiatus between the carboniferous and permian of the Old World.

6. *Pleurophorus* (*Cardinia*) *subcuneata;* Meek and Hayden.
7. *Lyonsia* (*Panopaea*) *concava;* Meek and Hayden.
8. *Panopaea Cooperi;* Meek and Hayden.
9. *Nautilus eccentricus;* Meek and Hayden.
10. *Leda* (*Nucula*) *subscitula;* Meek and Hayden.

A fine series of fossils, which we have supposed to be of jurassic age, were obtained from the Black Hills during the summer of 1857. None of the species, so far as examined, seem to be positively identical with those found in the jura of Europe, but they all belong to the same genera, and many of the species are closely allied to forms which are characteristic of that period in the Old World. In order to render more clear our opinion that these fossils are jurassic, I will repeat, in connexion with the names of each species, the evidence derived from the study of the fossils, which has already been published by Mr. Meek and myself, in March, 1858:

1. *Lingula brevirostris*, Meek and Hayden.
2. *Avicula* (*Monotis*) *tenuicostata*, M. and H., a closely allied representative of the liassic species *Monotis substriata*, Munster.
3. *Mytilus pertenuis*, M. and H.
4. *Arca* (*Cucullea*) *inornata*, M. and H. Very similar to *C. Munsteri* (Leiten) from the Lias.
5. *Panopaea* (*Myacites*) *subelliptica*, M. and H. Very similar to the liassic forms, *M. liassensis* and *M. Alduininus* of Quensted.
6. *Ammonites cordiformis*, M. and H., may be regarded as the American representative of the European liassic species, *A. cordatus* of Sowerby.
7. *Ammonites Henryi*, M. and H.
8. *Belemnites densus*, M. and H. This species is so closely allied to the oolitic *B. eccentricus*, Blainville, that we are in great doubt whether it is really distinct. It is also allied to the *B. panderianus* of d'Orbigny, from the lower oolite.
9. *Pentacrinus asteriscus*, M. and H., so closely resembles the *P. scalaris*, Golfuss, that it was with considerable hesitation that it was described as new.

From the above evidence we think we may safely consider the group of rocks from which the fossils were collected as the American representative of the jurassic rocks of the Old World. We have still in the collection several undescribed species, which are all of jurassic types.

There is, also, at the base of No. 1, in the Black Hills, a fresh water deposit, which we are in doubt whether to place with the jurassic or lower cretaceous. The fossils are a species of *Unio*, (*U. nucalis*, Meek and Hayden,) and a small *Planorbis*.

Near the mouth of the Judith river, on the Missouri, is a most interesting series of strata, deposited in a basin-like depression in cretaceous formation, No. 1. These beds are composed of sand, sandstone, clays, and very impure lignite, with remains of fresh water, land, and a few estuary shells; also, remains of saurians, turtles, fishes, &c. The exact age of this deposit has not yet been determined, the mollusca pointing to the conclusion that it belongs

to the tertiary period, while the vertebrata are considered by Dr. Leidy to belong to Wealden types and allied to those forms, discovered by Dr. Mantell, in the Wealden strata of England. With evidence so conflicting before us, it will be necessary to make a second exploration of that region before we can come to any positive conclusion as to its age. The following section, in descending order, will represent the different beds with sufficient accuracy and detail for our present purpose.

Section of fresh water and estuary deposits near the mouth of Judith river.

A.	80 feet..	Yellow arenaceous marl passing downwards into gray grit, with small seams of lignite; contains great numbers of *Ostrea subtrigonalis?*, *Cyrena occidentalis*, *Melania convexa*, &c.
B.	10 feet..	Impure lignite, containing much sand. *Ostrea subtrigonalis?* and silicified wood.
C	80 feet..	Alternations of sand and clay, with particles of lignite; also reddish argillaceous concretions with a few saurian teeth, and fresh water shells.
D.	20 feet..	Alternate strata of sand and clay, with impure lignite and silicified wood in a good state of preservation.
E.	100 feet..	Variable bed, consisting of alternations of sand and clay with large concretions containing great numbers of *Melania*, *Paludina*, *Helix*, *Planorbis*, *Cyclas*, &c., associated with saurian remains resembling the *Iguanodon* and *Megalosaurus*, *Trionyx*, &c.
F.	25 feet..	Alternations of impure lignite and yellowish-brown clay, the latter containing great numbers of *Unio*, *Paludina*, *Melania*, *Cyclas*, and the fresh remains referred by Dr. Leidy to the genus *Lepidotus*.
G.	100 feet..	Ferruginous sand and clay, having in upper part a seam three or four inches in thickness, nearly made up of shells of *Unio*. Lower part ferruginous and coarse gray grit, with a seam near the base entirely composed of remains of *Unio Danai*, *U. Dewyi*, and *U. subspatulata*.

Table showing the stratigraphical position of the fossils from the "Bad Lands" of the Judith.

	A.	B.	C.	D.	E.	F.	G.
VERTEBRATA.							
1. *Paleoscincus costatus*, Leidy	---	---	---	---	o	---	---
2. *Trachodon mirabilis*, Leidy	---	---	---	o	o	---	---
3. *Troodon formosus*, Leidy	---	---	---	---	o	---	---
4. *Deinodon horridus*, Leidy	---	---	---	o	o	---	---
5. *Crocodilus humilis*, Leidy	---	---	---	o	o	---	---
6. *Trionyx foveatus*, Leidy	---	---	---	---	o	---	---
7. *Lepidotus occidentalis*, Leidy	---	---	---	---	---	o	---
8. *Lepidotus Haydeni*, Leidy	---	---	---	---	---	o	---
MOLLUSCA.							
9. *Cyrena occidentalis*, Meek & Hayden	o	---	---	---	---	---	---
10. *Corbula subtrigonalis*, Meek & Hayden	o	---	---	---	---	---	---
11. *Corbula perundata*, Meek & Hayden	o	---	---	---	---	---	---
12. *Physa subelongata*, Meek and Hayden	---	---	---	---	o	---	---
13. *Paludina vetula*, Meek & Hayden	o	---	---	---	---	---	---
14. *Paludina Conradi*, Meek & Hayden	o	---	---	---	---	---	---
15. *Melania subtortuosa*, Meek & Hayden	---	---	o	---	---	---	---
16. *Melania omitta*, Meek & Hayden	---	---	---	---	---	---	o
17. *Melania subleavis*, Meek & Hayden	---	---	---	---	---	---	o
18. *Melania invenusta*, Meek & Hayden	o	---	---	---	---	---	---
19. *Vitrina obliqua*, Meek & Hayden	---	---	---	---	o	---	---
20. *Helix occidentalis*, Meek & Hayden	---	---	---	---	*	---	---
21. *Helix vitrinoides*, Meek & Hayden	---	---	---	---	*	---	---
22. *Planorbis tenuivolvis*, Meek & Hayden	---	---	---	---	*	---	---
23. *Planorbis amplexus*, Meek and Hayden	---	---	o	---	---	---	---
24. *Unio Danai*, Meek & Hayden	---	---	---	---	---	---	o
25. *Unio Deweyanus*, Meek and Hayden	---	---	---	---	---	---	o
26. *Unio subspatulatus*, Meek & Hayden	---	---	---	---	---	---	o

The cretaceous group, which occupies so extensive an area on the Upper Missouri, has been separated into five divisions, which present well marked lithological differences and contain, for the most part, distinct species of organic remains.

Vertical section of the cretaceous formations of Nebraska Territory, so far as determined.

CRETACEOUS SYSTEM.	No. 5.		Gray and yellowish arenaceous clays, and sandstones, sometimes weathering to a pink color; containing *Belemnitella bulbosa*, *Nautilus Dekayi*, *Ammonites placenta*, *A. lobatus*, *Scaphites Conradi*, *Baculites ovatus*, and great numbers of other marine mollusca.	Moreau trading post and under the tertiary at Sage and Bear cr'ks. Fox hills.	100 to 150 feet.
	No. 4.		Bluish and dark gray plastic clays, containing *Nautilus Dekayi*, *Ammonites placenta*, *Baculites ovatus*, and *B. compressus*, with numerous other marine mollusca—remains of *Mosasauras*.	Great area about Ft. Pierre and along the Missouri below there. Under No. 5, at Sage and Bear cr'ks. Great Bend of the Missouri. Near Milk and Muscle Shell rivers.	350 feet.
	No. 3.	20 feet.	Dark, very fine unctuous clay, containing much carbonaceous matter, with veins and seams selenite, sulphuret of iron, fish and scales, (local.)	Bluffs along the Missouri, below the Great Bend. Extends to Big Sioux river, and occurs along the latter stream.	150 feet.
		100 feet.	Lead gray calcareous marl, weathering above to a yellowish tint. Scales and other remains of fishes—*Ostrea congesta*—passing downwards into		
		30 feet.	Light gray or yellowish limestone, containing great numbers of *Inoceramus problematicus*, fish scales, and *Ostrea congesta*.		
	No. 2.		Dark gray laminated clay scales and other remains of fishes, small Ammonites, *Inoceramus problematicus?*, *Serpula*, small oyster-like *O. congesta*, &c , &c.	Along the Missouri Bluffs, from ten miles above James river to Big Sioux river.	90 feet. Wanting in
	No. 1.		Yellowish and reddish friable sandstone, with alternations of dark and whitish clays. Seams and beds of impure lignite, fossil wood, impressions of dicotyledonous leaves; *Solen*, *Pectunculus*, *Cyprina*, &c. Lower cretaceous.	Near the mouth of Big Sioux river, and between there and Council Bluffs. Near Judith river.?	90 to 100 feet, or more.

Formation No. 1 seems to constitute paleontologically an independent division, none of its organic remains ranging in other formations above or below. Nos. 2 and 3 seem to form one group, the *Ostrea congesta* and *Inoceramas problematicus* passing from one to the other. Divisions 4 and 5, which are the most fossilliferous formations on the Upper Missouri, contain many species in common, especially of the Cephalopoda, and therefore form a third group.

The cretaceous system, as developed on the Upper Missouri, therefore forms lithologically five well marked subdivisions, while paleontologically it admits of separation into three independent groups. The age and geological position of divisions 2, 3, 4, and 5, have been sufficiently attested by the numerous species of organic remains which have been published, from time to time, by my associate, Mr. Meek, and myself. In regard to the age of No. 1 much doubt existed, until we had an opportunity to examine a fine series of Dicotyledonous leaves, which I had discovered in this formation near Blackbird Hill, on the Missouri, while attached to Lieutenant Warren's party, in the spring of 1857. These leaves proved to us that the formation under consideration could not be older than cretaceous, and this conclusion was published by us in several of our later papers. Although the evidence that it is of lower cretaceous age was perfectly satisfactory to us, some writers have considered it triassic, while others have regarded it as jurassic and even miocene tertiary. In a late publication addressed to Mr. Meek and the writer, Professor Marcou says: "Allow me respectfully to suggest to you that I cannot see anything of cretaceous in what you call No. 1 of your Nebraska section. It appears to me that you put in your No. 1, or lower cretaceous, all sorts of strata of different ages, except true cretaceous rocks." That the rocks in question are not newer than cretaceous I will endeavor to prove, both from stratigraphical and paleontological evidence.

Evidence from stratigraphical position.

Near the old Otoe village, on the Platte river, about five miles above its mouth, No. 1 rests directly upon limestone strata of the true coal measures; and at this point I found a species of *Laurus*, apparently identical with a plant obtained near the mouth of the Big Sioux, and at Blackbird Hill. Near De Soto, about twenty miles above Omaha City, the carboniferous limestone ceases to appear, and No. 1 rests with concordant stratification upon it. There is not the slightest disturbance of the strata in this region, but they dip gently toward the northwest. I traced No. 1 with great care to Blackbird Hill, about sixty miles above De Soto, and found a few plants at different localities. At Blackbird Hill an extensive quarry had been opened to procure stone for building the large mission establishment at that place. From this quarry I collected the fine series of dicotyledonous leaves, before mentioned. I then directed my course toward the mouth of the Big Sioux, about forty miles further up the Missouri, and examined the country with great care. The red sandstone, No. 1, was the principal rock in that region, but upon the summits of the bluffs, resting

upon the sandstone apparently, I often found layers of a yellowish white rather soft limestone, fully charged with *Inoceramas problematicus* and fish remains. Near Sioux City, about two miles below the mouth of Big Sioux river, is a vertical section of No. 1, rising about thirty feet above the water's edge. At the base of this vertical cut I collected a number of leaves, similar to those observed at Blackbird Hill. From the high bluffs, bordering upon the Missouri, the inhabitants of this region obtain immense quantities of the calcareous rock of No. 3, composed almost entirely of *I. problematicus*, and convert it into lime. On the Big Sioux river, about six miles above its mouth, I took the following section of the strata from a vertical cut with considerable care. Yellow marl, a recent deposit.

No. 3. Shaly limestone, gradually passing into bed below, with an abundance of *Inoceramas problematicus*, and fish remains.

No. 2. Dark plastic shaly clay, with ferruginous concretions.

No. 1. *a*—Yellow friable sand.

b—Earthy lignite, 6 inches.

c—Variegated sandstones and clays, extending to water's edge, with Dicotyledonous leaves.

Section near the mouth of Iowa creek.

No. 3. Gray and yellow marl, with immense numbers of *I. problematicus*, *Ostrea congesta*, and fish remains.

No. 2. Dark plastic clay with *Ammonites* resting concordantly upon the bed below.

No. 1. Sandstone just above water edge.

At this last locality I found in No. 1 the plant which Prof. Heer refers to, *Laurus primigenia*, and a shell which we have described as *Solen Dakotaensis*. Here No. 1 passes from sight beneath the well known cretaceous bed No. 2.

With regard to our No. 1 holding a position beneath well marked cretaceous beds, I think I need not say anything further.

Paleontological evidence.

The fine series of fossil plants from No. 1, which I collected on the Missouri, as well as those obtained by my friend, Mr. Meek, and myself, during our recent trip to Kansas, were placed in the hands of our friend, Dr. J. S. Newberry, the well known authority in fossil botany, and from him we received the following notes:*

"They include so many highly organized plants, that were there not among them several genera exclusively cretaceous, I should be disposed to refer them to a more recent era."

"A single glance is sufficient to satisfy any one they are not triassic. Up to the present time no angiosperm dicotyledonous plants have been found in rocks older than cretaceous, while of the eighteen species which comprise your collection, sixteen are of this character."

The species of your fossil plants are probably all new, though gen-

* Dr. Newberry's remarks will appear in the January number of Silliman's Journal with our joint paper.

erally closely allied to the cretaceous species of the Old World. From the limited study I have given them, I have referred them to the following genera:

Sphenopteris,	*Pyrus*,
Abietites,	*Alnus*,
Acer,	*Salix*,
Fagus,	*Magnolia*,
Populus,	*Credneria*,
Cornus,	*Ettingshausinia*,
Liriodendron.	

"Of these the last two are exclusively cretaceous and highly characteristic of that formation in Europe."

From the evidence which we have given, we think we are warranted in regarding our No. 1 as cretaceous, and probably of lower cretaceous age. This matter will be discussed more fully hereafter. The red sandstone at the mouth of Big Sioux is the type of our No. 1, and its relations to the sandstone strata, near the Judith river, are not positively determined.

Table showing the stratigraphical position of the cretaceous fossils hitherto identified from Nebraska Territory.

	Formations in ascending order.				
	1	2	3	4	5
1. GENUS CALLIANASSA.					
1. *Callianassa Danai*, Hall & Meek	----	----	----	o	----
2. GEN. BELEMNITELLA.					
2. *Belemnitella mucronata*, Schlotheim	----	----	----	o	----
3. *Belemnitella? halhaser*, Meek & Hayden	----	----	----	o	----
3. GEN. NAUTILUS.					
4. *Nautilus De Kayi*, Morton	----	----	----	o	o
4. GEN. AMMONITES.					
5. *Ammonites placenta*, De Kay	----	----	----	o	o
6. *Ammonites lobatus*, Tuomy	----	----	----	o	o
7. *Ammonites opalus*, Owen	----	----	----	----	----
8. *Ammonites complexus*, Hall & Meek	----	----	----	o	----
9. *Ammonites percarinatus*, Hall & Meek	----	o	o	----	----
10. *Ammonites Halli*, Meek & Hayden	----	----	----	o	----
5. GEN. TUNILITES.					
11. *Turrilites Nebrascensis*, Meek & Hayden	----	----	----	----	----
12. *Turrilites Cheyennensis*, Meek & Hayden	----	----	----	----	----
13. *Turrilites umbilicatus*, Meek & Hayden	----	----	----	----	----
14. *Turrilites (Helicoceras) cochleatus*, Meek & Hayden	----	----	----	----	----

TABLE—Continued.

	Formations in ascending order.				
	1	2	3	4	5
6. GEN. ANCYLOCERAS.					
15. *Ancyloceras ? Nicolletti*, Hall & Meek	----	----	----	o	----
16. *Ancyloceras ? Mortoni*, Hall & Meek	----	----	----	o	----
17. *Ancyloceras (Hamites) uncus*, Meek & Hayden	----	----	----	o	----
7. GEN. PTYCHOCERAS.					
18. *Ptychoceras Mortoni*, Meek & Hayden	----	----	----	o	----
8. GEN. HELICOCERAS.					
19. *Helicoceras tenuicostatus*, Meek & Hayden	----	----	----	o	----
20. *Helicoceras ? tortus*, Meek & Hayden	----	----	----	o	----
9. GEN. BACULITES.					
21. *Baculites ovatus*, Say	----	----	----	o	o
22. *Baculites, compressus*, Say	----	----	----	o	o
23. *Baculites grandis*, Hall & Meek	----	----	----	----	o
10. GEN. SCAPHITES.					
24. *Scaphites Conradi*, Morton, Sp	----	----	----	----	o
25. *Scaphites Mandenensis*, Morton, Sp	----	----	----	----	o
26. *S. Nicolletti*, Morton, Sp	----	----	----	o	o
27. *S. nodosus*, Owen	----	----	----	o	----
28. *S. larviformis*, Meek & Hayden	----	o	----	o	----
11. GEN. SCALARIA.					
29. *S. cerithiformis*, Meek & Hayden	----	----	----	----	o
12. GEN. TURRITELLA.					
30. *T. ? convexa*, Meek & Hayden	----	----	----	o	----
31. *T. Moreauensis*, Meek & Hayden	----	----	----	----	o
13. GEN. ACTEON.					
32. *A. concinnus*, Hall & Meek	----	----	----	o	o
33. *A. subellipticus*, Meek & Hayden	----	----	----	o	----
34. *A. (Soliduta) attenuata*, Meek & Hayden	----	----	----	o	o
14. GEN. AVALANA.					
35. *A. subglobosa*, Meek & Hayden	----	----	----	----	o
15. GEN. NATICA.					
36. *N. Tuomyana*, Meek & Hayden	o	----	----	----	----
37. *N. oblqiuata*, Hall & Meek	----	----	----	o	----
38. *N. cocinna*, Hall & Meek	----	----	----	o	----
39. *N. paludinaformis*, Hall & Meek	----	----	----	o	----
40. *N. ambigua*, Meek & Hayden	----	----	----	----	o

TABLE—Continued.

	Formations in ascending order.				
	1	2	3	4	5
15. GEN. NATICA—Continued.					
41. *N. subcrassa*. Meek & Hayden	o	----	----	----	----
42. *N. occidentalis*, Meek & Hayden	----	----	----	----	o
43. *N. Moreauensis*, Meek & Hayden	----	----	----	----	o
16. GEN. SOLARIUM.					
44. *S. flexuistriatum*, Evans & Shumard	----	----	----	o	----
17. GEN TURBO.					
45. *T. Nebrascensis*, Meek & Hayden	----	----	----	o	----
46. *T. tenuilineatus*, Meek & Hayden	----	----	----	o	----
18. GEN. ROSTELLARIA.					
47. *R. Nebrascensis*, Evans and Shumard	----	----	----	o	----
48. *R. fusiformis*, Hall & Meek	----	----	----	o	----
49. *R. biangulata*, Meek & Hayden	----	----	----	o	----
19. GEN. FUSUS.					
50. *F. Shumardi*, Hall & Meek	----	----	----	o	----
51. *F. tenuilineatus*, Hall & Meek	----	----	----	o	----
52. *F. Dakotaensis*, Meek & Hayden	----	----	----	----	o
53. *F. Galpinianus*, Meek & Hayden	----	----	----	----	o
54. *F. contortus*, Meek & Hayden	----	----	----	----	o
55. *F. Culbertsoni*, Meek & Hayden	----	----	----	----	o
56. *F. flexuocostatus*, Meek & Hayden	----	----	----	----	o
57. *F. Newberryi*, Meek & Hayden	----	----	----	----	o
58. *F. Vaughani*, Meek & Hayden	----	----	----	----	o
59. *F. subturritus*, Meek and Hayden	----	----	----	o	----
60. *F. intertextus*, Meek & Hayden	----	----	----	o	o
61. *F.* (*Pleurotoma*) *Scarboroughi*, Meek & Hayden	----	----	----	----	o
20. GEN. BUSYCON.					
62. *B. Bairdi*, Meek & Hayden	----	----	----	----	o
21. GEN. FASCIOLARIA.					
63. *F. cretacea*, Meek & Hayden	----	----	----	----	o
64. *F. buccinoides*, Meek & Hayden	----	----	----	----	o
22. GEN. BUCCINUM.					
65. *B.? vinculum*, Hall & Meek	----	----	----	o	----
66. *B. constrictum*, Hall & Meek	----	----	----	o	----
23. NEW GEN. PSEUDOBUCCINUM, Meek & Hayden.					
67. *P. Nebrascensis*, Meek & Hayden	----	----	----	----	o

TABLE—Continued.

	Formations in ascending order.				
	1	2	3	4	5
24. GEN. CAPULUS, Hall & Meek.					
68. *C. occidentalis*, Hall & Meek	----	----	----	o	----
69. *C. fragilis*, Meek & Hayden	----	----	----	----	o
25. GEN. HELCION.					
70. *H. borealis*, Morton, Sp.	----	----	----	o	----
71. *H. sexcucatus*, Meek & Hayden	----	----	----	o	----
72. *H. patelliformis*, Meek & Hayden	----	----	----	o	----
73. *H. alveolus*, Meek & Hayden	----	----	----	o	----
74. *H. subovatus*, Meek & Hayden	----	----	----	o	----
75. *H. carinatus*, Meek & Hayden	----	----	----	o	----
26. GEN. DENTALIUM.					
76. *D. gracilis*, Hall & Meek	----	----	----	o	----
77. *D. fragilis*, Meek & Hayden	----	----	----	o	----
27. GEN. BULLA.					
78. *B. volvaria*, Meek & Hayden	----	----	----	----	o
79. *B. minor*, Meek & Hayden	----	----	----	----	o
80. *B. occidentalis*, Meek & Hayden	----	----	----	o	----
81. *B. subcylindricus*, Meek & Hayden	----	----	----	o	----
28. GEN. XYLOPHAGA.					
82. *X. elegantula*, Meek & Hayden	----	----	----	*	----
83. *X. Stimpsoni*, Meek & Hayden	----	----	----	o	----
29. GEN. PHOLAS.					
84. *P. cuneata*, Meek & Hayden	----	----	----	----	o
30. GEN. TEREDO.					
85. *T. globosa*, Meek & Hayden	----	----	----	----	o
31. GEN. SOLEN.					
86. *S ? Dakotaensis*, Meek & Hayden	o	----	----	----	----
32. GEN. PHOLODOMYA.					
87. *P. elegantula*, Evans & Shumard	----	----	----	o	----
88. *P. (Gonomya) Americana*, Meek & Hayden	----	----	----	----	o
89. *P. undata*, Meek & Hayden	o	----	----	----	----
90. *P. fibrosa*, Meek & Hayden	----	----	----	o	----
91. *P. subventricosus*, Meek & Hayden	o	----	----	----	----
33. GEN. PANOPEA.					
92. *P. occidentalis*, Meek & Hayden	o	----	----	----	----

TABLE—Continued.

	Formations in ascending order.				
	1	2	3	4	5
34. GEN. SOLEMYA.					
93. *S. subplicata*, Meek & Hayden	----	----	----	----	o
35. GEN. MACTRA.					
94. *M. formosa*, Meek & Hayden	o	----	----	----	----
95. *M. Warrenana*, Meek & Hayden	----	----	----	----	o
96. *M. alta*, Meek & Hayden	o	----	----	----	----
36. GEN. TELLINA.					
97. *T.? cheyennensis*, Meek & Hayden	o?	----	----	----	----
98. *T. equilateralis*, Meek & Hayden	----	----	----	o	----
99. *T. scitula*, Meek & Hayden	----	----	----	----	o
100. *T. subelliptica*, Meek & Hayden	----	----	----	----	o
101. *T. Prouti*, Meek & Hayden	----	----	----	o	----
102. *T. subtortuosa*, Meek & Hayden	o	----	----	----	----
37. GEN. CYTHEREA.					
103. *C. Missouriana*, Morton	----	----	----	o	----
104. *C. orbiculata*, Hall & Meek	----	o	----	----	----
105. *C. tenuis*, Hall & Meek	----	o	----	----	----
106. *C. Deweyi*, Meek & Hayden	----	----	----	----	o
107. *C. Nebrascensis*, Meek & Hayden	----	----	----	----	o
108. *C. pellucida*, Meek & Hayden	----	----	----	o	----
109. *C. Owenana*, Meek & Hayden	o	----	----	----	----
38. GEN. VENUS.					
110. *V.? circularis*, Meek & Hayden	----	----	----	o	----
39. GEN. LEDA.					
111. *L. ventricosa*, Meek & Hayden	----	----	----	----	o
112. *L. Moreauensis*, Meek & Hayden	----	----	----	----	o
40. NEW GEN. CORBULAMELLA, Meek & Hayden.					
113. *C. gregaria*, Meek & Hayden	----	----	----	o	----
41. GEN. THRACIA.					
114. *T.? gracilis*, Meek & Hayden	o	----	----	----	----
42. GEN. ASTARTE.					
115. *A. gregaria*, Meek & Hayden	----	----	----	----	o
43. GEN. CRASSATELLA.					
116. *C. Evansi*, Hall & Meek	----	----	----	o	----

TABLE—Continued.

	Formations in ascending order.				
	1	2	3	4	5
44. GEN. LUCINA.					
117. *L. subundata*, Hall & Meek	----	----	----	o	----
118. *L. occidentalis*, Meek & Hayden	----	----	----	o	----
45. GEN. HETTANGIA.					
119. *H. Americana*, Meek & Hayden	o	----	----	----	----
46. GEN. CYPRINA.					
120. *C. arenaria*, Meek & Hayden	o	----	----	----	----
121. *C. cordata*, Meek & Hayden	----	----	----	----	o
122. *C. compressa*, Meek & Hayden	----	----	----	----	o
123. *C. ovata*, Meek & Hayden	----	----	----	----	o
124. *C. subtumida*, Meek & Hayden	----	----	----	o	o
47. GEN. CARDIUM.					
125. *C. Speciosum*, Meek & Hayden	o	----	----	----	----
48. GEN. NUCULA.					
126. *N. subnasuta*, Hall & Meek	----	----	----	o	----
127. *N. ventricosa*, Hall & Meek	----	----	----	o	----
128. *N. scitula*, Meek & Hayden	----	----	----	----	o
129. *N. Evansi*, Meek & Hayden	----	----	----	----	o
130. *N. equilateralis*, Meek & Hayden	----	----	----	----	o
131. *N. subplana*, Meek & Hayden	----	----	----	o	----
132. *N. cancellata*, Meek & Hayden	----	----	----	----	o
133. *N. planomarginata*, Meek & Hayden	----	----	----	----	o
134. *N. obsoletastriata*, Meek & Hayden	----	----	----	o	----
49. GEN. PECTUNCULUS.					
135. *P. parvula*, Meek & Hayden	----	----	----	----	o
136. *P. subimbricatus*, Meek & Hayden	----	----	----	----	o
50. GEN. CUCULLEA.					
137. *C. Nebrascensis*, Owen	----	----	----	----	o
138. *C. cordata*, Meek & Hayden	----	----	----	----	o
139. *C. Shumardi*, Meek & Hayden	----	----	----	----	o
140. *C. exigua*, Meek & Hayden	----	----	----	o	----
51. GEN. MYTILUS.					
141. *M. attenuatus*, Meek & Hayden	----	----	----	----	o
142. *M. Galpinianus*, Evans & Shumard	----	----	----	----	o
143. *M. subarcuatus*, Meek & Hayden	o	----	----	----	----
52. GEN. AVICULA.					
144. *A. triangularis*, Evans & Shumard	----	----	----	o	----
145. *A. linguiformus*, Evans & Shumard	----	----	----	o	----
146. *A. Haydeni*, Hall & Meek	----	----	----	o	----

TABLE—Continued.

	Formations in ascending order.				
	1	2	3	4	5
53. GEN. GERVILIA.					
147. *G. subtortuosa*, Meek & Hayden	----	----	----	o	----
54. GEN. INOCERAMUS.					
148. *I. problematicus*, Schlothein	----	----	o	----	----
149. *I. Barabini*, Morton	----	----	----	o	----
150. *I. Sagensis*, Owen	----	----	----		----
151. *I. Nebrascensis*, Owen	----	----	----	o	----
152. *I. subleavis*, Hall & Meek	----	----	----	o	----
153. *I. convexus*, Hall & Meek	----	----	----	o	----
154. *I. tenilineatus*, Hall & Meek	----	----	----	o	----
155. *I. Conradi*, Hall & Meek	----	o	----	----	----
156. *I. fragilis*, Hall & Meek	----	o	----	----	----
157. *I. ventricosus*, Meek & Hayden	o	----	----	----	----
158. *I. pertenuis*, Meek & Hayden	o	----	----	----	----
159. *I. incurvus*, Meek & Hayden	----	----	----	o	----
160. *I. umbonatus*, Meek & Hayden	----	----	----	o	----
55. GEN. PECTEN.					
161. *P. rigida*, Hall & Meek	----	----	----	o	----
162. *P. Nebrascensis*, Meek & Hayden	----	----	----	o	o
56. GEN. OSTREA.					
163. *Ostrea congesta*, Conrad	----	----	o	----	----
164. *Ostrea larva*, Lamark	----	----	----	o	----
165. *Ostrea patina*, Meek & Hayden	----	----	----	o	----
166. *Ostrea glabra*, Meek & Hayden	o	----	----	----	----
57. GEN. CAPRINELLA.					
167. *Caprinella coraloidea*, Hall & Meek	----	----	----	o	----
58. GEN. LINGULA.					
168. *Lingula subspatulata*, Hall & Meek	----	----	----	o	----
59. GEN. SERPULA.					
169. *Serpula? tenuicarinata*, Meek & Hayden	----	o	----	----	----
60. GEN. HEMIASTER.					
170. *Hemiaster? Humphreysianus*, Meek & Hayden	----	----	----	o	----
61. VERTEBRATA.					
171. *Mosagarus Missouriensis*, Leidy	----	----	----	o	----

There are still in the collection several undescribed species of mollusca, also remains of fishes from Nos. 2, 3, and 4.

The great lignite tertiary basin differs from the tertiary basin of White river, by its numerous beds of lignite, more or less pure, and by the extent and beauty of its fossil flora. Some of the beds of lignite are seven feet in thickness, but they usually vary from two to four feet. The collection of fossil plants from this deposit is very fine, consisting of nearly fifty species, all of which are as yet undescribed, but are supposed to be new to science. Many of the leaves strongly resemble those of existing forest trees, and seem to belong to the genera Platanus, Acer, Ulmus, Alnus, Populus, Betula, Shulex, &c. The mollusca consist of land and fresh water, with a few estuary shells. These have all been described, and drawings made. Five species of vertebrata have been discovered in this deposit. The following species of organic remains have, up to this time, been described from this basin.

VERTEBRATA.

1. *Thespesius occidentalis*, Leidy.
2. *Ischyrotherium antiquum*, Leidy.
3. *Mylognathus priscus*, Leidy.
4. *Compsemys victus*, Leidy.
5. *Emys obscurus*, Leidy.

MOLLUSCA.

6. *Cyclas formosa*, Meek and Hayden.
7. *Cyclas fragilis*, Meek and Hayden.
8. *Cyclas subellipticus*, Meek and Hayden.
9. *Cyrena moreauensis*, Meek and Hayden.
10. *Cyrena intermedia*, Meek and Hayden.
11. *Corbula mactriformis*, Meek and Hayden.
12. *Unio priscus*, Meek and Hayden.
13. *Bulimus teres*, Meek and Hayden.
14. *Bulimus vermiculus*, Meek and Hayden.
15. *Bulimus limneaformis*, Meek and Hayden.
16. *Bulimus Nebrascensis*, Meek and Hayden.
17. *Pupa helicoides*, Meek and Hayden.
18. *Limnea tenuicosta*, Meek and Hayden.
19. *Physa longiuscula*, Meek and Hayden.
20. *Physa rhomboidea*, Meek and Hayden.
21. *Physa Nebrascensis*, Meek and Hayden.
22. *Planorbis subumbilicatus*, Meek and Hayden.
23. *Planorbis convolutus*, Meek and Hayden.
24. *Planorbis fragilis*, Meek and Hayden.
25. *Velletia (Ancylus) minuta*, Meek and Hayden.
26. *Paludina multi lineata*, Meek and Hayden.
27. *Paludina Leai*, Meek and Hayden.
28. *Paludina retusa*, Meek and Hayden.
29. *Paludina peculiaris*, Meek and Hayden.
30. *Paludina trochiformis*, Meek and Hayden.
31. *Paludina Leidyi*, Meek and Hayden.

32. *Valvata parvula*, Meek and Hayden.
33 *Melania minutula*, Meek and Hayden.
34. *Melania Anthonyi*, Meek and Hayden.
35. *Melania multistriata*, Meek and Hayden.
36. *Melania Nebrascensis*, Meek and Hayden.
37. *Melania Warrenana*, Meek and Hayden.
38. *Melania tenui carinata*, Meek and Hayden.
39. *Cerithium Nebrascensis*, Meek and Hayden.

The tertiary basin of White and Niobrara rivers forms one of the most interesting and remarkable fresh water deposits on our continent. It differs, both lithologically and paleontologically, from the two basins previously alluded to. It contains no fossil plants, no lignite beds, and not one of the numerous species of organic remains which have been collected from it is identical or allied to species found in other portions of the tertiary of the northwest. Two distinct faunas are represented by the collections from this deposit. The fauna of the miocene period from the region of White river, and the fauna of the pliocene period from the Niobrara. The latter fauna has enabled Dr. Leidy, the distinguished comparative anatomist, to arrive at some important conclusions. He says:

"The extinct fauna of the Niobrara is especially rich in remains of ruminating and equine animals. Among the former are several peculiar genera, of which two are closely allied to *Oreodon* and *Leptauchenia*, of the miocene deposit of the Mauvaises Terres; one is allied to the musk-deer and another closely approaches the camel. Besides the remains of a true species of *Equus*, the collection contains those of two species of *Hipparion*, and several peculiar genera of the equine family. There are also remains of several species of canine and feline animals, of a small species of beaver, and of a species of porcupine more nearly allied to that of the old world than to our own recent one. The collection further contains remains of a rhinoceros, resembling those of India, those of a new species of mastodon, and those of a large elephant.

"One of the most remarkable circumstances in relation with this extinct fauna is, that it is more nearly allied to the present recent one of the old world than to that of our own continent. From a comparison of our recent fauna and flora with that of the eastern continent, the deduction has been made, that the western continent is the older of the two, geologically speaking, whereas, the Niobrara fauna would indicate just the reverse relationship of age. A number of similar instances show that totally different fauna and flora may be cotemporaneous, and do not necessarily indicate different period of existence."

Vertical section, showing the order of superposition of the different beds of the Tertiary basin of White and Niobrara rivers.

		Subdivisions.	Localities.	Estimated thickness.
POST PLIOCENE.		Yellow silicious marl, similar in its character to the loess of the Rhine, passing down into variegated indurated clays and brown and yellow fine grits; contains remains of extinct quadrupeds, mingled with those identical with recent ones; also a few mollusca, mostly identical with recent species so far as determined.	Most fully developed along the Missouri river, from the mouth of the Niobrara to St. Joseph; also in the Platte valley and on the Loup Fork.	300 to 500 feet.
PLIOCENE TERTIARY.	Bed F.	1st. Dark gray or brown sand, loose, incoherent. with remains of mastodon, elephant, &c. 2d. Sand and gravel, incoherent. 3d. Yellowish white grit, with many calcareous, arenaceous concretions. 4th. Grey sand with a greenish tinge; contains the greater part of the organic remains. 5th. Deep yellowish red arenaceous marl. 6th. Yellowish gray grit, sometimes quite calcareous, with numerous layers of concretionary limestone from two to six inches in thickness, containing fresh water and land-shells, Succinea, Limnea, Paludina, Helix, &c., closely allied and perhaps identical with living species; also much wood of coniferous character.	Covers a very large area on Loup Fork, from the mouth of North Branch to source of Loup Fork; also in the Platte valley. Most fully developed on the Niobrara river, extending from the mouth of Turtle river three hundred miles up the Niobrara. Also on Bijoux Hills and Medicine Hills. Thinly represented in the valley of White river.	300 to 400 feet.
MIOCENE.	Bed E.	Usually a coarse grained sandstone, sometimes heavy bedded and compact; sometimes loose and incoherent; varies much in different localities. Forms immense masses of conglomerate; also contains layers of tabular limestone with indistinct organic remains; very few mammalian remains detected, and those in a fragmentary condition. Passes gradually into the bed below.	Most fully developed along the upper portion of Niobrara river and in the region around Fort Laramie. Seen also on White river and on Grindstone Hills.	180 to 200 feet.
	Bed D.	A dull reddish brown indurated grit, with many layers of silico-calcareous concretions, sometimes forming a heavy-bedded fine-grained sandstone; contains comparatively few organic remains.	Niobrara and Platte rivers; well developed in the region of Fort Laramie; also in the valley of White river. Conspicuous, and composing the main part of the dividing ridge between White and Niobrara rivers.	350 to 400 feet.

VERTICAL SECTION—Continued.

	Subdivisions.		Localities.	Estimated thickness.
MIOCENE.	Bed C.	Very fine yellow calcareous sand, not differing very materially from Bed D, with numerous layers of concretions and rarely organic remains, passing down into a variegated bed, consisting of alternate layers of dark brown clay and light grey calcareous grit, forming bands, of which I counted twenty-seven at one locality, varying from one inch to two feet in thickness.	White river, Bear creek, Ash Grove spring, head of Shyenne river. Most conspicuous near White river.	50 to 80 feet.
	Turtle and Oreodon Bed B.	A deep flesh colored argillo-calcareous indurated grit; the outside, when weathered, has the appearance of a plastic clay. Passes down into a gray clay, with layers of sandstone; underlaid by a flesh colored argillo-calcareous stratum, containing a profusion of mammalian and chelonian remains. Turtle and Oreodon Bed.	Old Woman's creek, a fork of Shyenne river; also on the head of the South Fork of the Shyenne; most conspicuous on Sage and Bear creeks, and at Ash Grove spring. Well developed in numerous localities in the valley of White river.	80 to 100 feet.
	Titanotherium Bed A.	Light gray fine sand, with more or less calcareous matter, passing down into an ash-colored plastic clay, with large quantities of quartz grains disseminated through it, sometimes forming aggregated masses like quartzose sandstone cemented with plastic clay; then an ash-colored clay with a greenish tinge, underlaid at base by a light gray and ferruginous silicious sand and gravel, with pinkish bands Immense quantities of silex in the form of seams all through the beds. Titanotherium Bed.	Old Woman's creek; also in many localities along the valley of the South Fork of Shyenne. Best development on Sage and Bear creeks. Seen at several localities in the valley of White river.	80 to 100 feet.
CRETACEOUS.	Nos. 4 and 5.	Cretaceous beds 5 and 4, with their usual lithological characters and fossils.	Exposed underneath the tertiary beds on the South Fork of Shyenne and its southern branches, also in White river valley near its source.	

Catalogue of all the fossils hitherto described, from the tertiary formations of White and Niobrara rivers, with a table showing their stratigraphical position.

	Beds in ascending order.					
	A.	B.	C.	D.	E.	F.
RUMINANTIA.						
1. *Oreodon gracilis*, Leidy	----	o	o	o	----	----
2. *Oreodon Culbertsoni*, Leidy	----	o	o	o	----	----
3. *Oreodon major*, Leidy	----	o	----	o	----	----
4. *Agriochœrus major*, Leidy	----	o	----	o	----	----
5. *Agriochœrus antiquus*, Leidy	----	o	----	o	----	----
6. *Poebrotherium Wilsoni*, Leidy	----	o	----	----	----	----
7. *Leptomeryx Evansi*, Leidy	----	o	----	o	----	----
8. *Leptauchenia decora*, Leidy	----	----	----	o	----	----
9. *Leptauchenia major*, Leidy	----	----	----	o	----	----
10. *Protomeryx Halli*, Leidy	----	----	----	o	----	----
11. *Merycodus necatus*, Leidy	----	----	----	----	----	o
12. *Megalomeryx niobrahensis*, Leidy	----	----	----	----	----	o
13. *Merychochœrus proprius*, Leidy	----	----	----	o	----	----
14. *Procamelus occidentalis*, Leidy	----	----	----	----	----	o
15. *Procamelus robustus*, Leidy	----	----	----	----	----	o
16. *Procamelus gracilis*, Leidy	----	----	----	----	----	o
17. *Merychyus elegans*, Leidy	----	----	----	----	----	o
18. *Merychyus medius*, Leidy	----	----	----	----	----	o
19. *Merychyus major*, Leidy	----	----	----	----	----	o
20. *Cervus Warreni*, Leidy	----	----	----	----	----	o
MULTUNGULA.						
21. *Chœropotamus* (*Hyopotamus*) *americanus*, Leidy	o	----	----	----	----	----
22. *Entelodon Mortoni*, Leidy	----	o	----	o	----	----
23. *Entelodon ingens*, Leidy	----	o	----	o	----	----
24. *Titanotherium Prouti*, Leidy	o	----	----	----	----	----
26. *Paleochœrus probus*, Leidy	----	o	----	o	----	----
27. *Leptochœrus spectabilis*, Leidy	----	o	----	o	----	----
28. *Rhinoceros occidentalis*, Leidy	----	o	o	o	o	----
29. *Rhinoceros* (*Hyracodon*) *nebrascensis*, Leidy	----	o	o	o	o	----
30. *Rhinoceros crassus*, Leidy	----	----	----	----	----	o
31. *Mastodon* (*Tetralophodon*) *merificus*, Leidy	----	----	----	----	----	o
32. *Elephas* (*Euelephas*) *imperator*, Leidy	----	----	----	----	----	o
SOLIDUNGULA.						
33. *Hipparion*, *S. Hippotherium occidentale*, Leidy	----	----	----	----	----	o
34. *Hipparion*, *S. Hippotherium speciosum*, Leidy	----	----	----	----	----	o
35. *Anchitherium Bairdi*, Leidy	----	o	----	----	----	----
36. *Anchitherium* (*Hypohippus*) *affinis*, Leidy	----	----	----	o	----	----
37. *Anchitherium* (*Parahippus*) *cognatus*, Leidy	----	----	----	o	----	----
38. *Merychippus insignis*, Leidy	----	----	----	----	----	o
39. *Merychippus mirabilis*, Leidy	----	----	----	----	----	o
40. *Equus excelsus*, Leidy	----	----	----	----	----	o
41. *Equus* (*Protohippus*) *perditus*, Leidy	----	----	----	----	----	o
RODENTIA.						
42. *Steneofiber nebrascensis*, Leidy	----	----	o	o	----	----
43. *Ischyromys typus*, Leidy	----	----	o	o	----	----

MINERALS AND GEOLOGICAL SPECIMENS.

	I. IGNEOUS AND METAMORPHIC ROCKS.	
1	Gneiss ferruginous	12 miles northwest of Fort Laramie
2	Mica slate	do do
3	Mica, more micaceous	do do
4	Granite, coarse	Laramie peak
5	Mica slate, with silvery mica	4 miles north of Fort Laramie
6	Granite, pulverulent	Raw Hide butte
7	Felspar, flesh-colored from No. 6	do
8	Granite, fine grained, micaceous	do
9	Granite, gray	Laramie hill
10	Quartz, white	do
11	Hornblende slate	do
12	Hornblende rock	do
13	Mica slate	do
14	Hornblende rock in granite	do
15	Red felspar from 14	do
16	Crystalline quartz from 14	do
17	Flesh-colored felspar from 14	do
18	Mica slate, with garnets	do
19	Mica slate, with garnets	do
20	Mica, containing iron	do
21	Flesh-colored felspar in large crystals	do
22	Chlorite slate	do
23	Mica slate	do
24	Granite, coarse, over No. 23	do
25	Felspathic granite, pink	do
26	Quartz veins in 25	do
27	Hornblende rock, masses in granite	do
28	Granite, fine grained	do
29	Hornblende rock	do
30	Hornblendic granite	do
31	Hornblende, with crystals of felspar	do
32	Mica slate, hornblendic	do
33	Mica slate, hornblendic	do
34	Mica slate, with large plates of mica	do
35	Granite, white felspathic	do
36	Quartz, veins in 35	do
37	Silicious limestone, silurian or devonian	do
38	do do highly crystalline	do
39	do do do	do
39½	Syenite, pink, under 39	do
40	Metamorphic silicious limestone	Raw Hide butte
41	do do purplish	do
42	Quartz, in granite	do
43	Metamorphic limestone, gray	do
44	Mica slate	do
45	Micaceous granite	do
46	do	do
47	Mica slate, fine grained	do
48	Metamorphic limestone, crystalline	do
49	do do purplish	do
50	do do similar to 48	do
51	Talcose slate	do
52	Felspathic granite, flesh-colored	do
53	Mica slate, with garnets	do
54	do very fine grained	do
55	Talcose slate, dark	do
56	do light	do
57	Porphyritic trap	Black hills

Minerals and geological specimens—Continued.

58	Hornblende slate	Black hills
59	Felspathic granite, pink	do
60	Plates of mica from 59	do
61	Quartz vein in chlorite slate	do
62	Chlorite slate	do
63	Trachyte	do
64	Quartz veins in 63	do
65	do	do
66	Chlorite slate	Raw Hide butte, west side
67	Hornblende rock, underlying tertiary series	do do
68	Schorl in quartz from clay slate	Black hills
69	do do	do
70	Augite	do
71	Quartz, with felspar	Laramie hills
72	Porphyritic trap, columnar	Stone butte, Black hills
73	do do	do do
74	do do	do do
75	Trachyte	do do
76	Vesicular trap	do do
77	Trachyte	do do
78	Silicious limestone	Raw Hide butte
79	Porphyritic trachyte	Stone butte, Black hills
80	Compact trachyte, with scales of mica	Bear peak, Black hills
81	do do	do do
82	Gray basaltic trap	do do
83	Porphyritic trachyte	do do
84	do	do do
85	Quartzite	do do
86	Gray trachyte	do do
87	Metamorphic sandstone	do do
	II. SEDIMENTARY ROCKS.	
	Silurian and devonian.	
89	Potsdam sandstone, red, with *Lingula antiqua*	do do
90	do gray, fine, with *Obolus*	do do
91	do porous, with Trilobites	do do
92	Metamorphic, conglomerate over granite	Laramie hills
93	do with cherty pebbles	do
94	do do	do
95	Argillaceous limestone, devonian	do
96	Metamorphic conglomerate	do
	Carboniferous.	
97	Limestone, with spirifer	Black hills
98	Blue cherty limestone, with *Spirigera subtilita*	do
99	do do with corals	do
100	do do with *Spirifer lineatus*	do
101	*Rhynconella mormoni*	do
102	do do with *Cyathophyllum*	do
103	do do with *Zaphrentis*	do
104	do do with *Syringapora*	do
105	do do *Porites*	do
106	Yellowish do. over 98, with *Spirifer rockymontana*	do
107	do do *Spirifers cameratus and lineatus*	do
108	Cherty nodules in 98	do
109	*Arogonite* in 98	do
110	Coarse, granular limestone, with crinoidal columns	Fort Laramie

Minerals and geological specimens—Continued.

111	Blue, compact, limestone, *Productus and Terebratula subtilita*	Fort Laramie
112	do do do corals	do
113	do do with *Spirifer lineatus*	do
114	Yellowish cherty limestone, with *Productus*	Warm spring near Fort Laramie
115	White limestone, with *Spirifer rockymontana*	Near Fort Laramie
116	Terebratula subtilita from 110	
117	*Panopaea*	Near Tecama, Nebraska
118	*Allorisma*	Bellevue, Nebraska
119	*Productus*	do
120	*Spirifer cameratus*	do
121	*Terebratula subtilita*	do
122	*Bellerophon*	do
123	*Chonetes*	do
124	*Chaetetes*	do
	Permo-carboniferous and permian.	
125	Arenaceous limestone, foliated with *bakevellia*	Black hills
126	Red sandstone, soft, very fine grain, under 125	do
127	Pink sandstone, over 126	do
128	Limestone, (125,) with *Orthoceratite*	do
129	do with *Bellerophon*	do
130	do with *Pleurotomania*	do
131	do with *Spirifer*	do
132	do with *Allorisma*	Big Blue, Kansas Territory
133	Yellow magnesian limestone, with *Nautilus, Monotis, Bakevellia, Myalina*	Smoky Hill fork
134	do compact, with *Mytilus*	Banks of Mo., south line of Neb.
135	Magnesian limestone, with *Monotis*	Big Cottonwood
136	do with *Avicula*	12 miles west Big Blue
137	Chertz rock, gray, with *Avicula and Myalina*	Black hills
138	do (Burch stone,) with crinoidal columns	do
139	Sacarhoid gypsum, over 133	Smoky Hill fork
140	*Monotis* from 136	do
141	Blue limestone, porous, with fenestella	Big Blue
142	Cellular calcareous rock	Smoky Hill fork
143	do do more compact	do
144	do do with spherical cavities	do
145	do do more argillaceous	Near Cottonwood creek
	Jurassic.	
146	Arenaceous limestone, light brown, with *Avicula tenuicostata*	Black hills
147	do bluish, over 146, with *Avicula*	do
148	Ferruginous limestone, with *Cypricardia*	do
149	do red, with *Avicula*	do
150	Yellow arenaceous limestone, with *Serpula*	do
151	Limestone bored, with lithophagous mollusks	do
152	Red marl, overlying 141, containing snowy gypsum	do
153	Snowy gypsum from 152	do
154	Crystalline gypsum from seams in 152	do
155	Fibrous gypsum do do	do
156	Blue compact limestone, (fresh water,) in 158, containing *Unio nucalis and Planorbis*	do
157	Arenaceous limestone, same as 150, containing pentacrinus, with serpula and ostrea attached to surfaces	do
158	Yellowish argillo-arenaceous limestone, with ostrea, Upper Jurassic	do do
159	Gray shell limestone, containing *Ammonites, Belemites, &c*, interstratified with 158	do

Minerals and geological specimens—Continued.

160	Snowy gypsum, with n › stains, equivalent of 153..	Big Horn river
161	Gypsum, with crystals of selenite	
162	Snowy gypsum	Near sources of Yellowstone
	CRETACEOUS.	
	Formation No. 1.	
163	Conglomerate and sandstone, with *Unios*	Bad lands of Judith
164	Conglomerate	do
165	do fine, with *Melanias and Cyclas*	do
166	Gray arenaceous limestone, with *Melania and helix*	do
167	Conglomerate, same as 165	do
168	Arenaceous limestone, (166,) with leaves of *credneria, melanias, &c*	do
169	Indurated ferruginous clay, with *melanias*	do
170	Ferruginous sand, with *unio danai*	do
171	Indurated clay, with *Melanias* and scales of Lepidotus above 166	do
172	Shell limestone containing *Melanias*	do
173	Impure sandy lignite (stratum D of section)	do
174	Shell limestone, same as 172	do
175	Cream colored shale, burnt from over lignite beds	do
176	Compact argillaceous limestone, with *Cytherea oweni* (marine,) beneath fresh water beds	do
177	Ferruginous sandstone, with *Tellina subtortuosa*	do
178	Rough, gray, limestone, with *Ostrea glabra*	do
179	Ferruginous sandstone, with *Inoceramus pedenuis*, upper marine strata	do
180	Lignite, over 179	do
181	Carbonaceous sand from decomposition of lignite bed over 179	Rocky Mountain creek
182	Impure shaly lignite, with selenite	Near Ammel's island
183	Limestone, with *Cypris*, lower part of formation No. 1	Black hills, east base
184	Silicified wood, ferruginous	do do
185	do coniferous	do do
186	Bone of saurian	do do
187	do or cetacian	do do
188	Dense ferruginous sandstone	Black hills, west base
189	Quartzose sandstone, bluish	do do
190		
191	Conglomerate from junction of cretcaeous and carboniferous rocks	Platte valley
192	Coarse ferruginous sandstone, with pebbles, over 199	do
193	Dark ferruginous sandstone over 192	do
194	do containing much iron	do
195	do do do	do
196	Ferruginous sandstone	Blackbird hill
197	do fine grained	Mouth of Elk horn
198	Dark, coarse, sandstone, very ferruginous	do
199	Red, ferruginous sandstone, with many species of dicotyledonous leaves	Black hills
200	do do	
201	Light gray quartzose sandstone, with balls of sulphate of iron over 199	Black hills
202	do with dicotyledonous leaves	do
203	Whitish puverulent sandstone over 199	Sioux City
204	do fine grained under 199	Blackbird hill
205	Indurated clay, bluish	do
206	do yellow	Decatur

Minerals and geological specimens—Continued.

207	Indurated clay, yellow	Decatur
208	Ferruginous sandstone, with striated bivalves and *Cytherez arenaria*	Big Sioux
209	Indurated clay, with dicotyledonous leaves	do
210	do sand, fine, yellow, with leaves of salix	do
211	Ferruginous sandstone	Mouth of Iowa creek
212	do do fine grained, with impressions of dicotyledonous leaves	Mouth Big Sioux
213	do do with *Solen dacotahensis*	do
214	Lignite under 209	do
215	Silicified wood, bored by teredo	Big Sioux
216	do do	Blackbird hills
217	do do	Smoky Hill fork
218	do do	Republican fork
219	Coarse, ferruginous sandstone, with leaves of *Credneria*	Smoky hill
220	Sandstone, very ferruginous	do
221	Cellular, ferruginous, rock	do
	Formation No. 2.	
222	Masses sulphuret iron, with sulphate	Mouth of Vermillion
223	Crystallized do do	do
224	do gypsum	do
225	do do	do
226	do in plates	do
227	Large crystals selenite in black clay	do
228	do do do	do
229	Ferruginous shale, with remains of fishes	do
230	do shell limestone	do
231	Yellow clay, with gypsum	do
232	Conglomerate, with green silicious pebbles	do
233	do with shark's teeth	do
234	Gray arenaceous limestone, with *Cytherea orbiculata*	do
235	do do with fish scales	do
236	Dark gray indurated clay, with fish scales	Black hills, east base
237	Arenaceous limestone, (234,) with *Serpula*	Dixon's bluffs
238	Conglomerate, with fish teeth	do
239	Arenaceous limestone, gray, with *Inoceramus problematicus*	Black hills, west base
	Formation No. 3.	
240	Soft, yellow, limestone, with *Inoceramus problematicus*	Big Sioux
241	Gray marl, with *Ostrea congesta*, and fish remains (base of No. 3)	Mouth James river
242	do do	do
243	Scale of *Cyclorladus* in 242	do
244	Fibrous carbonate of lime, with *Ostrea congesta* attached to surface	Durions hills
245	Yellow marl	do
246	do	Bijoux hills
247	do lighter	do
248	Crystalline carbonate of lime, seams in marl	do
249	do greenish in marl	do
250	Black plastic clay, upper part of No. 3	Near Bijoux hills
251	Shale, argillaceous, with fish remains over 250	do
252	do calcined by combustion of 250	do
	Formation No. 4.	
253	Blue clay, with *Ptychoceras mortoni*	Great bend of Missouri

Minerals and geological specimens—Continued.

254	Yellow clay, with crystals of gypsum	Great bend of Missouri
255	Whitish alum clay, seams in 253	Bijoux hills
256	Hyd. silicate of magnesia, masses in formation No. 4	do
257	Crystals sulphate baryta	do
258	White aluminous earth in seams	do
259	Aluminous clay (255)	do
260	Ferruginous concretions throughout F, No. 4	do
261	Crystalline argillaceous limestone (Cone in cone)	Shyenne river
262	Crystals of selenite in clay beds	Fort Pierre
263	Selenite and fibrous carbonate lime	Mouth Shyenne
264	Yellow clay, with selenite	12 miles above Fort Pierre
265	Dark, argillaceous, shale, with *Inoceramus*	Mouth of Cannon Ball river
266	Blue concretionary limestone, with *Rostellaria*	Long Lake, Missouri
267	Indurated clay	do
268	Decomposed shale (253)	Fort Pierre
269	Brown hematite	Big Shyenne
270	do more earthy	do
271	Dog tooth spar	Mussel Shell river
272	Gray arenaceous limestone	Milk river
273	do with carbonized matter, and shells	Cannon Ball river
274	Soft argillaceous shale	Yellow Stone river
275	Concretions of compact blue limestone, containing great numbers of fossils	do
276	do containing large crustacean (undescribed)	do
277	Crystallized carbonate of lime, yellow, forming nucleus of concretions	Forks of Shyenne
278	Crystals of selenite	do
279	Blue indurated clay, with fibrous gypsum	do
280	Dove colored laminated shale	Grand river
281	Petrified wood bored by *Teredo bisinuata*	
282	"Cone in cone" (241)	Cannon Ball river
283	Indurated clay, with shells	Grand river
284	Soft micaceous sandstone, thin seam in clay bed	Fort Pierre
285	Vertebra of *Mososaurus*	do
286	Wood bored by *Zylophaga stimpsoni*	Mussel shell river
287	White aluminous clay	Fort Lookout
	Formation No. 5.	
288	Yellow arenaceous limestone, with *Venus*	Head of Little Missouri
289	do softer	do
290	Yellowish calcareous sandstone, with *Cyprina*	Cannon Ball river
291	do do decomposed	do
292	Soft, fine, sandstone, with *Rostellaria*	do
293	Ferruginous sandstone, with Cytherea	do
294	Silicified wood, with bark	Long Lake
295	do bored by *Teredo globosa*	do
	TERTIARY.	
	A. lignite basin.	
296	Yellow arenaceous clay on cetaceous rocks	
297	Yellowish indurated clay, with fresh water shells over 296	Long Lake
298	Gray sand, fine, over 297	do
299	Coarse, gray, calcareous sandstone, with fossils	Top of Square butte
300	Soft argillo-calcareous shale, with fossil shells	Thunder Butte
301	Ferruginous shale, with coniferous plants	do
302	Dove colored sandstone, with silicified wood	do

Minerals and geological specimens—Continued.

303	Yellow indurated sand, with estuary shell of genus, *Cyrena*	Cherry creek
304	Light colored indurated clay, base of section	Fort Clark
305	Dark carbonaceous clay, over 304	do
306	Lignite, over 305	do
307	Dark argillaceous shale, over 306	
308	Yellow indurated sand, with *Paludina and Melania*	
309	Grayish indurated sand	
310	Dove colored calcareous shale, with *Unios* and other fresh water shells	Red spring
311	Argillaceous limestone, with fossil plants	Fort Berthold
312	Fine light colored marl, under lignite bed	do
313	Lignite, bright and compact	do
314	Drab indurated clay	High butte, Little Missouri
315	Light colored marl, with impressions of dicotyledonous leaves	Fort Union
316	Earthy lignite	do
317	Lignite	Yellowstone
318	do more impure	do
319	Concretions sulphuret iron, common throughout tertiary series	do
320	Septaria, spherical	Fort Union
321	Carbonaceous indurated clay, charged with vegatable remains, fresh water, and land shells, *Bulimus, Physa, Pupa, &c*	do
322	Mineralized wood	do
323	Carbonized wood from lignite bed	do
324	Light sandy marl	do
325	Shell marl, containing fresh water shells	do
326	Impure lignite	do
327	Light colored, fine, clay, under lignite bed	do
328	Brown shale, with vegetable impressions	Milk river
329	Silicious shale, containing much vegetable matter	do
330	Gray shell limestone, soft	do
331	Carbonaceous clay, with *Unio, Paludina, &c*	Yellowstone
332	Coarse, gray shell, limestone	Elk Horn prairie
333	Compact, bluish, limestone, with fresh water shells	Red spring
334	Gray calcareous sandstone, with *Unio, Paludina, &c*	Yellowstone
335	Soft argillaceous limestone, with *Paludina rochiformis*	Pardu river
336	Crystallized carbonate of lime in concretions	Fort Union
337	Dove colored argillactous limestone, with impressions of ferns, over 315	do
338	Brown calcareous shale, with *Tuxites*	Yellowstone
339	Silicified wood	do
340	do partially carbonized	do
341	do do do	do
342	do do do	do
343	do do do	do
344	do with cavities lined with drusy quartz	Fort Union
345	Dove colored clay, metamorphosed by burning out of lignite beds	Mussel Shell river
346	Brownish shale do do do	do
347	Scoria, black, formed by do do	Yellowstone
348	do yellowish do do do	do
349	do black compact do do	do
350	do green vitreous	do
351	do do do do do	do
352	do red, very porous	do
353	do brown, very porous do do	do
354	Shale burned red, with vegetable impressions	do
355	do bright red do do	do
356	do vermillion, with gypsum	do

Minerals and geological specimens—Continued.

356½	Shale, burned, black ferruginous	Yellowstone
357	Calcareous pumice from burning of limestone	do
	B. WHITE RIVER BASIN.	
	Bed A.	
358	Red, sandy, clay, containing pebbles, base of *Titanotherium* bed	On Shyenne river
359	Teeth of *Titanotherium prouti*	Old Woman's fork
360	Coarse, whitish, sandstone, above 358	Shyenne river
361	do concretionary	do
362	Soft, whitish, calcareous sandstone, with scales of mica	do
363	Greenish plastic clay	do
364	do upper part	Sage creek
365	Plates of chalcedony	Bear creek
366	do	do
367	do	do
368	Fibrous carbonate lime	do
369	Dark chalcedony	do
370	Magnesite	do
371	Calcareous concretion separating bed *a* from bed *b*	do
	Bed B.	
372	Pinkish, indurated, marl	do
373	Whitish do from over 372	do
374	Pinkish calcareous concretion	do
375	Decomposed marl from 372 and 373	do
376	do do with *Oreodon*	do
	Bed D.	
377	Cream colored marl	White river
378	Silicious limestone, with fresh water shells, *Planorbis, Limnea, &c*	do
379	Tufaceous, concretionary, limestone	do
380	Cream colored marl, containing *Oreodon*	do
	Bed E.	
381	Soft, white, grit	do
382	Conglomerate, above 381	do
383	do with granitic pebbles	do
384	Soft, white, sandstone, with *Oreodon*	do
385	Calcareous conglomerate	Fort Laramie
386	Conglomerate	Bijoux hills
387	Calcareous concretions in marl, under 386	do
388	Sulphate baryta foliated crystals in 387	do
389	Green silicious concretions in limestone, containing fresh water shells	Medicine hills
390	do do do	do
391	Coarse, whitish, sandstone	Bad Land creek
392	Conglomerate	Grand Stone hill
393	Quartzose conglomerate	do
394	White infusorial earth, base of bed *e*, local	Running Water
395	do do do	Loup fork
396		
397	Indurated marl, white	Warren's fork
398	Silicious tufa	Niobrara river
399	White marl	Loup fork

Minerals and geological specimens—Continued.

400	Whitish cherty limestone	do
401	White foliated limestone	Niobrara river
402		
403	White tufaceous marl, containing fresh water shells	Loup Fork
404	Silicified wood	Running Water
405	do	do
406	Siliceous sinter	Sage creek
407	Carbonate of lime	Bear Peak
408	Ferruginous conglomerate	Yellowstone river
409	Micaceous granite	do
410	Hornblendic rock	do
411	Limestone, with corals	do
412	do with *Spirifer*	do
413	do with *Orthoceratite*	do
414	do with *Syringopora*	do
415	Chalcedony	do
416	Silicified wood	do
417	Limestone, with red chert	do
418	Concretions from yellow marl	Big Sioux
419	Siliceous sinter from springs	Black Hills
420	Sand from sand hills	do
421	Very fine, gray, sand from sand dune	Powder river
422	Prismatic iron ore	Mouth Bigh Horn
423	Efflorescence on soil	Cannon Ball river

Dr. Newbery rendered me valuable assistance in making out the preceding catalogue.

MAMMALS.

The mammals of the collection have already been examined by Professor Baird, and most of the species determined. The collection contains skins, skeletons, and skulls of nearly all the larger mammals of the plains, with a large number of specimens of most of the smaller ones. I will here say a few words in regard to the present distribution of some of the larger animals on the upper Missouri. Many of them are fast passing away, and in a few years must become extinct. The buffalo, which has been so important an agent in the preservation of the Indians, is now gradually gathering into a smaller area, and although in the valley of the Yellowstone and along the upper Missouri thousands may yet be seen, they are annually decreasing at a rapid rate. In 1850 buffaloes were seen as low down on the Missouri as the Vermilion river, and in 1854 a few were killed near Fort Pierre, but at the present time none, except now and then a stray bull, are seen below Fort Clark. The broad undulating prairies around the Black Hills were, a few years ago, the resort of myriads of these animals, but at the present time it is very rare to see even a wanderer. They are, however, quite abundant at this time on the Platte river and along the valley of the Smoky Hill Fork of the Kansas. Probably at this time all the larger animals, as buffalo, elk, deer, antelope, bighorn, and beaver, are more abundant in the valley of the Yellowstone than in any other portion of the upper Missouri.

Descending the Yellowstone river in the summer of 1854 I saw, for for the distance of 350 miles, the prairies on both sides of the river covered with herds of buffalo, and on the sand bars large numbers of elk, deer, and antelopes. Elk and white-tailed deer (*Cervus leucurus*) are quite abundant even in the northern parts of Iowa, but the black-tailed deer (*Cervus macrotis*) is seldom seen below Fort Pierre. It is found chiefly in the most rugged portions of the country, in the region of the Black Hills or in the vicinity of the mountains. The interminable ravines of Sage creek and the Shyenne river are noted places for them. The antelope is seldom observed below Fort Pierre. It is, however, the most abundant animal in the Sioux country, and confined to the open praries. The bighorn, or mountain sheep, (*Ovis montana*,) is quite abundant in the almost inaccessible regions known as the Mauvaises Terres or Bad Lands, but are not hunted much by the Indians for food. The beaver are increasing very rapidly, and many of the mountain streams literally swarm with them. Since the days of the trapper are over, and the prices of their fur has become so reduced, the inducements to hunt them are not very great, and they are allowed to multiply undisturbed. Their flesh is eaten to some extent by the Indians and traders, and in the absence of other meat is considered quite a delicacy. The raccoon is seldom seen beyond the frontier. A few have been killed in the valley of White river, but they seldom pass up the Missouri above latitute 42°. The following is a list of the mammals contained in the collection and now deposited in the Smithsonian Institution:

1. *Sorex Haydeni*, Baird, (n. s.)—Hayden's Shrew.—Fort Pierre to Fort Union, Nebraska Range on the Missouri river, from latitude 44.20 to 48 00.—This small species of shrew is quite rare in Nebraska. It is seldom seen alive, though sometimes found dead along river banks. A single specimen was caught at Fort Pierre in the autumn of 1856, and a second one at Fort Union, near the mouth of the Yellowstone. Three specimens were secured.

2. *Blarina brevicauda*, Gray.—Short-tailed Shrew.—Illinois to Nebraska.—A single specimen of this species was obtained near Fort Berthold, on the Missouri, in lat. , lon. ; very rare.

3. *Scalops argentatus*, Aud. & Bach,—Silvery Mole.—Detroit to Fort Riley, and south to Prairie Mer Rouge? Range in lat. from 42.20 to Louisiana? in long. 83 to 97.—One specimen of this beautiful species was collected near the mouth of Big Sioux river. I do not think it occurs high up on the Missouri river.

4. *Lynx rufus*, Raf.—Wild Cat.—Atlantic to Pacific. Upper Missouri to the Gila river. Not on the Rio Grande?—The skins of this animal are very often brought to the different trading posts on the upper Missouri by the Indians, though seldom seen by the traveller. There is no portion of the country bordering on the Missouri river, or its tributaries, where it does not exist to a greater or less extent. The Canada Lynx, (*Lynx canadensis*,) has also been observed in several localities by the traders of the country.

5. *Canis occidentalis* var. *griseo-albus*.—White and Gray Wolf.—North America generally? *Canis occidentalis* var. *nubilus*.—Dusky Wolf.—Missouri river to the Pacific.—This species with its numerous varieties, is exceedingly abundant throughout the region of the upper Missouri, above latitude 43°. It is most abundant where the buffalo range, and subsists mostly upon them. Their skins are made an article of trade, being valued at one dollar a piece.

6. *Canis latrans*, Say.—Coyote; Prairie Wolf.—Fort Riley, Kansas, to the Pacific, and upper Missouri to the Rio Grande of Texas.—This animal is much smaller, and the skins sell for only half the price of the C. occidentalis. It is exceedingly abundant throughout the upper Missouri country, extending down into the settlements, where they often do much mischief to the farmers.

7. *Vulpes macrourus*, Baird.—Prairie Fox.—Upper Missouri to Plains of Columbia, O. T.—This is much the finest animal of the genus in this country. The skins are remarkable for the thickness and beauty of their fur. The different varieties, as silver, cross, and black fox, are well known among the traders, and are much valued. A skin of the silver variety is a great prize, often selling for a hundred dollars.

8. *Vulpes velox*, Aud. & Bach.—Kit Fox; Swift Fox.—Plains west of Missouri to the Cascade mountains of Oregon.—Like the prairie or barking wolf this animal is fond of wandering down among the settlements and committing his depredations upon the farmers. It is much hunted by the traders; but its skin is not very valuable, averaging only about twenty-five cents per skin. It is very abundant around prairie dog villages, and subsists to a great extent upon the inhabitants.

9. *Putorius longicauda*, Rich.—Long-tailed Weasel.—Upper Missouri and Platte. (Carlton House, H. B. T Rich.)—Not uncommon throughout the northwest, though seldom seen by the traveller. Its skin is highly prized by the Indians, who use it for making articles of dress, tobacco pouches, and for other ornamental purposes.

10. *Lutra canadensis*, Sab.—American Otter.—Northern parts of the United States to Florida, and west to the Rocky mountains.—Not uncommon in the streams that flow from the north into the Missouri. I cannot ascertain that it has been seen above the mouth of the Niobrara river on the Missouri. The only specimen obtained by our party was taken in a beaver trap in the Niobrara, about eighty miles above its mouth. Otter skins are imported into the country every year by the traders, and are prized very highly by the Indians for ornamental purposes.

11. *Mephitis mephitica*.—Common Skunk.—United States, east of the Missouri plains and north of Texas.—Very common throughout the upper Missouri country.

12. *Taxidea americana*, Waterh.—Missouri Badger.—Iowa and Wisconsin to the Pacific coast, and from Arkansas to 49 N. lat.—(To 58 N. lat , Rich.)—This animal is not rare, though not very abundant on the Missouri. It seems to be of very little economical value, except for food to the starving Indian.

13. *Procyon lotor*, Storr.—Common Raccoon.—Massachusetts to Florida, and west to Fort Kearney. Not in southern Texas?—Very abundant in the vicinity of Council Bluffs, where the skin is made a considerable article of trade with the Indians. It is not found high up on the Missouri. The highest point that I have observed it was near the mouth of the Niobrara river, though I have been informed that they are sometimes seen in the valley of White river.

14. *Ursus horibilis*, Ord.—Grizzly Bear.—Plains of upper Missouri to the Rocky mountains, and along their base, thence to the coast of California, (not of Oregon or Washington?)—This formidable animal is still quite abundant toward the sources of the Missouri. At the present time it is very seldom, if ever, seen below Fort Pierre. But one skin was taken by our party.

15. *Sciurus ludovicianus*, Custis.—Western Fox Squirrel.—Mississippi valley.—Very abundant about Council Bluffs. Gradually becomes rare, and ceases near the mouth of White river.

16. *Sciurus carolinensis*, Gm.—Gray Squirrel; Black Squirrel.—Eastern United States to the Missouri river.—Two specimens of this squirrel were taken, one near Fort Leavenworth, and the other near the mouth of the Platte. It is seldom, if ever, seen above this point.

17. *Sciurus fremontii*, Towns.—Mountain Gray Squirrel.—A specimen obtained at Laramie Peak is supposed to belong to this species.

18. *Sciurus hudsonius*, Pallas.—Red Squirrel; Chickaree —Labrador (lat. 56°) to Mississippi; and in the United States from the Atlantic to the Missouri river.—Several specimens supposed to be identical with this species were collected in the Black Hills, and is quite abundant in the oak woods of that region

19. *Tamias quadrivittatus*, Rich. — Missouri Striped Squirrel.—Upper Missouri to Rocky mountains, and west to the Cascade Range.

Along the Rocky mountains as far south as Fort Staunton, New Mexico Lat. 33° 30′.—Very common in the "Bad Lands" and rocky portions of the upper Missouri. Seldom, perhaps never, seen below Fort Pierre.

20. *Spermophilus franklini*, Rich.—Gray Gopher.—Northern Illinois and Wisconsin, and to Minnesota and Saskatchewan.—One specimen of the above species was taken near the mouth of the Loup Fork of the Platte. Quite rare.

21. *Spermophilus tridecem-lineatus*, Aud. & Bach.—Striped Gopher; Prairie Squirrel.—Eastern Michigan to the plains of the Missouri, and south to Red river, Arkansas, and Fort Thorn, N. M.—Very abundant on all the prairies of the northwest.

22. *Spermophilus Townsendii*, Bachman.—Townsend's spermophile. Rocky mountains to the north. Several specimens were collected near Fort Laramie.

23. *Cynomys ludovicianus*.—Prairie Dog.—Milk river and upper Missouri; west towards the Rocky mountains; south to Red river; southwest to the Upper Rio Grande, and a short distance into Sonora?—Very abundant from the mouth of the Niobrara to the mountains; found in great numbers in the valley of the Yellow stone and along the Missouri, above Fort Union.

24. *Arctomys flaviventer*, Bachman.—Yellow-footed Marmot.—Black Hills, Neb.—This animal is very rare, but one specimen having been secured on the upper Missouri. The skins of only two individuals are in the museum of the Smithsonian Institution.

25. *Castor canadensis*, Kuhl.—American Beaver.—Throughout the entire area of North America.—The history of this animal is more interesting than that of any other on the upper Missouri. In the palmy days of the trapper the beaver became very scarce in the west; but since the price of their fur has become so low as to render the business of trapping them an unprofitable pursuit, they have multiplied to an enormous extent, so that all the little streams flowing from the mountains literally swarm with them. Their skins, however, are still a considerable article of trade.

26. *Geomys bursarius*, Rich.—Pouched or Pocket Gopher.—Missouri to Minnesota and Nebraska.—Very abundant on the rich bottoms around Council Bluffs and Big Sioux, where they do much mischief in the gardens. One specimen was taken near the mouth of Big Sioux, and a second on the Niobrara.

27. *Thomomys rufescens*, Maxim.—Fort Union Gopher.—Fort Pierre to Fort Union, on the Missouri.—This gopher seems to take the place of the *Geomys bursarius* from Fort Pierre to the mountains. Two specimens were collected at Fort Union, and one at Fort Randall, on the Missouri.

28. *Jaculus hudsonius*.—Jumping Mouse.—Nova Scotia, (Labrador, Pennant,) to southern Pennsylvania, and west to the Pacific ocean.—Very rare. Only two specimens were obtained near Fort Union.

29. *Perognathus flavus*, Baird.—Upper Missouri, along eastern slopes of Rocky mountains to Sonora and Chihuahua; and along the Rio Grande to Matamoras.—Collected on the Loup Fork during the summer of 1857.

30. *Dipodomys ordii*, Woodhouse —Kangaroo Rat.—Platte river, along the eastern slope of the Rocky mountains, into Durango and Coahuila, Mexico.—A single specimen was taken on the Niobrara river.

31. *Mus musculus*, Linn.—Common Mouse.—North America generally. (Introduced.)—Abundant at all the fur trading posts on the Missouri. *Mus rattus* or common rat is also introduced

32. *Hesperomys sonoriensis*, Leconte.—Upper Missouri, and Rocky mountains to El Paso and Sonora.—Very abundant near Fort Union and along the Yellowstone. Twenty-five specimens collected.

33. *Hesperomys leucogaster*.—Missouri Mouse.—Plains along the upper Missouri.—Very rare; but two specimens secured; one near Bijox Hills, the other on Vermilion prairie, and are the only specimens in the museum of the Smithsonian Institution.

34. *Neotoma cinerea*.—Rocky Mountain Rat.—Eastern slope of northern Rocky mountains and upper Missouri.—Not rare, but seldom captured; usually found among the dry trees on the river bottoms. The only specimen secured was taken at Fort Sarpy, near the mouth of the Big Horn river, on the Yellowstone.

35. *Arvicola Haydeni*, Baird, (s.)—Fort Pierre, Nebraska.—But one specimen of this species has ever been detected.

36. *Lepus campestris*, Bach.—Prairie Hare.—Upper Missouri and Saskatchewan plains to the Cascade Range of Oregon.—This hare, though not extremely abundant, is not uncommon in the northwest, from the mouth of Niobrara river to the mountains. Four specimens were collected on the Yellowstone.

37. *Lepus sylvaticus*, Bach.—Gray Rabbit.—From Massachusetts throughout the United States, as far as Indianola, Texas? and west to the Missouri, as far as Fort Union, Nebraska.—Found all along the Missouri river to the mountains, but mostly confined to the wooded bottoms of the rivers and streams. Eight specimens are in the collection of the expedition.

38. *Lepus artemisia*, Bach.—Sage Hare.—Regions west of the Missouri to the Rocky mountains, and to the Cascade mountains of Oregon, along the Columbia on the north, and to the city of Chihuahua on the south.—Abundant in the Bad Lands and on the Sage plains of the upper Missouri river. Five specimens were obtained by the expedition.

39. *Cervus canadensis*, Erxl.—American Elk.—Northern portions of United States to upper Missouri, and west to the Pacific. Found in the Alleghenies of Pennsylvania and Virginia. (North to 57°, Rich.)—Most abundant in the valley of the Yellowstone and along the Missouri river above Fort Union. Not rare, though less abundant as low down the Missouri as Council Bluffs. The collection contains two pairs of skins, two of skeletons, with numerous separate skulls, and about twenty pairs of antlers.

40. *Cervus leucurus*, Douglass.—White-tailed Deer.—Upper Missouri and Platte to the Columbia river and Washington Territory. Western Texas and New Mexico?—Very abundant along the river bottoms; most common from Council Bluffs to Fort Pierre. Four skins, with numerous separate skins and antlers, were obtained.

41. *Cervus macrotis*, Say.—Mule Deer.—Upper Missouri and Platte to the Cascade Range, (head of Des Chutes river.) Oregon Territory. Not extending to the Pacific. Headwaters of Arkansas.—Much more abundant on the upper Missouri than the *Cervus leucurus*. Four skins, two skeletons, and about thirty separate skulls and horns, were collected.

42. *Antilocapra americana*, Ord.—Prong-horn Antelope; Cabree.—Plains west of Missouri, from the lower Rio Grande to the Saskatchewan, and west to the Cascade and coast range of the Pacific slope.—This beautiful and fleet animal is found everywhere on the open grassy plains, from the mouth of the Niobrara river to the mountains. Our collection contains eight skins entire, one skeleton, and a large number of skulls.

43. *Ovis montana*, Cuvier.—Bighorn; Mountain Sheep.—Broken ground on the upper Missouri and Platte. Rocky mountains generally, as far west, at least, as Coast and Cascade mountains of the Pacific slope.—Very abundant in the rugged and inaccessible portions of the upper Missouri, especially the "Bad Lands."

44. *Bos americanus*, Gmelin.—American Buffalo.—Formerly found throughout nearly the whole of North America, east of the Rocky mountains. Now confined to the plains west of the Missouri and along the slopes of the Rocky mountains.

45. *Vespertilio pruinosus*, Say.—All over the United States east of the Rocky mountains.

46. *Vespertilio noctivagans*, Leconte.—Common throughout the country east of the Rocky mountains.

47. *Vespertilio novaboracensis*, Gmelin.

BIRDS.

	No. of specimens.
1.—*Cathartes aura*, (Linn.) Illig. Turkey Buzzard. All of North America, except the Arctic regions	1
2.—*Falco (Falco) anatum*, Bonaparte. Duck Hawk. North America, east of the Rocky mountains	1
3.—*Falco (Hypotriorchis) columbarius*, Linn. Pigeon Hawk. Temperate North America, Mexico, Central America, Northern South America	2
4.—*Falco (Gennaia) polyagrus*, Cassin. Prairie Falcon. Western North America	3
5.—*Falco (Tinnunculus) sparverius*, Linn. Sparrow Hawk. Entire continent of America	5
6.—*Accipiter mexicanus*, Swains. Western North America	3
7.—*Buteo swainsoni*, Bonap. Swainson's Buzzard. Northern and Western North America	4
8.—*Buteo bairdii*, Hoy. Baird's Buzzard. Northern and Western North America	3

	No. of specimens.
9.—*Buteo (Poecilopternis) borealis*, (Gmelin,) Vieill. Red-tailed Hawk. Eastern North America; fur countries; Cuba, Jamaica	3
10.—*Archibuteo ferrugineus*, (Licht.) Gray. California Squirrel Hawk. Western North America	1
11.—*Circus hudsonius*, (Linn.) Vieillot. Marsh Hawk. All of North America and Cuba	4
12.—*Bubo virginianus*, (Gmelin,) Bon. Great Horned Owl. The whole of North America. Runs into varieties, *atlanticus pacificus*, *arcticus*, *magellanicus*	1
13.—*Otus wilsonianus*, Lesson. Long-Eared Owl. The whole of temperate North America	3
14.—*Brachyotus cassinii*, Brewer. Short-Eared Owl. The whole of temperate North America; Greenland; Cuba	2
15.—*Syrnium nebulosum*, (Forster,) Gray. Barred Owl. Eastern North America; Fort Tejon, Cal.	1
16.—*Athene hypugaea*, Bonap. Burrowing Owl. From Mississippi river to the Rocky mountains	7
17.—*Conurus carolinensis*, (Linn.) Kuhl. Parakeet. Southern and southwestern States, as far west as the Missouri	12
18.—*Coccygus americanus*, (Linn,) Bonap. Yellow-billed Cuckoo. Eastern United States to the Missouri plains	6
19.—*Coccygus erythrophthalmus*, (Wils.) Bon. Black-billed Cuckoo. United States to the Missouri plains	6
20.—*Picus (Trichopicus) villosus*, Linn. Hairy Woodpecker. Northern and western regions; var. *major*, *medius*, *minor*	6
21.—*Picus (Trichopicus) pubescens*, Linn. Downy Woodpecker. Eastern United States, towards the eastern slope of the Rocky mountains	3
22.—*Picoides dorsalis*, Baird. Striped three-toed Woodpecker. Laramie peak, Rocky mountains	1
23.—*Sphyrapicus varius*, (Linn.) Baird. Yellow-bellied Woodpecker. Atlantic ocean to the eastern slopes of Rocky mountains, Greenland	8
24.—*Sphyrapicus thyroideus*, (Cass.) Baird. Brown-headed Woodpecker. Cascade and coast range of California and Oregon	1
25.—*Centurus carolinus*, (Linn.) Bon. Red-bellied Woodpecker. North America, from Atlantic coast to the eastern slope of the Rocky mountains	3
26.—*Melanerpes erythrocephalus*, (Linn.) Sw. Red-headed Woodpecker. North America, from the Atlantic to the eastern slope of the Rocky mountains	9
27.—*Melanerpes torquatus*, (Wils.) Bonap. Lewis' Woodpecker. Western America, from Black Hills to Pacific	6

	No. of specimens.
28.—*Colaptes auratus*, (Linn.) Sw. Flicker. Eastern North America to the eastern slopes of the Rocky mountains; Greenland	8
29.—*Colaptes mexicanus*, Swain. Red-shafted Flicker. Western North America, from the Black Hills to Pacific	21
29a.—*Colaptes hybridus*, Baird. Cross between two preceding. Upper Missouri	
30.—*Cheatura pelasgia*, Stephens. Chimney Swallow. Eastern United States to the slopes of the Rocky mountains; Bijox Hills, O. T.	1
31.—*Antrostomus nuttalli*, (Aud.) Cassin. Nuttall's Whip-poor-will. High Central Plains to the Pacific coast	2
32.—*Chordeiles popetue*, (Vieill.) Baird. Night Hawk. North America generally	5
33.—*Ceryle (Megaceryle) alcyon*, (Linn.) Boie. Belted Kingfisher. Entire continent of North America.	2
34.—*Tyrannus carolinensis*, (Linn.) Baird. King Bird. Eastern North America to Rocky mountains	9
35.—*Tyrannus verticalis*, Say. Arkansas Flycatcher. Western North America, from the High Central Plains to the Pacific	19
36.—*Sayornis fuscus*, (Gm.) Baird. Pewee. Eastern North America	1
37.—*Sayornis sayus*, (Bon.) Baird. Say's Flycatcher. Upper Missouri river and Central High Plains westward to the Pacific and south to Mexico	5
38.—*Contopus richardsonii*, (Sw.) Baird. Short-legged Pewee. High Central Dry Plains to the Pacific; Rio Grande valley southward to Mexico; Labrador	2
39.—*Empidonax minimus*, Baird. Least Flycatcher. Eastern United States to Fort Bridger	6
40.—*Turdus (Turdus) mustelinus*, Gm. Wood Thrush. Eastern United States to Missouri	1
41.—*Turdus (Turdus) fuscescens*, Stephens. Wilson's Thrush. Eastern North America to the Missouri; north to fur countries	1
42.—*Turdus (Turdus) swainsonii*, Cab. Olive-backed Thrush. Eastern North America to Fort Bridger; south to Mexico and Peru; north to Greenland; accidental in Europe and Siberia	3
43. *Turdus (Turdus) aliciae*, Baird. Gray-cheeked Thrush. Mississippi region to the Missouri	4
44.—*Turdus (Planesticus) migratorius*, Linn. Robin. Continent of North America to Mexico	3
45.—*Sialia sialis*, (Linn.) Baird. Blue Bird. Eastern North America to west of Missouri river; Fort Laramie	9
46. *Sialia arctica*, Sw. Rocky Mountain Blue Bird. Upper Missouri to Rocky mountains range, and south to Mexico; rare on the coast of California	9

	No. of specimens
47.—*Regulus calendula*, (Linn.) Licht. Ruby-crowned Wren. United States, from Atlantic to Pacific	4
48.—*Anthus ludovicianus*, (Gm.) Licht. Tit-lark. North America generally; Greenland; accidental in Europe	1
49.—*Mniotilta varia*, (Linn.) Vieill. Black and White Creeper. Eastern North America to Missouri river; south to Guatemala. Var. *longirostris*, Baird. Florida	6
50.—*Parula americana*, (Linn.) Bonap. Blue yellow-backed Warbler. Eastern North America to Missouri river; south to Guatemala	1
51.—*Geothlypis trichas*, (Linn.) Cab. Maryland Yellow-throat. North America, from Atlantic to Pacific	7
52.—*Icteria longicauda*, Lawr. Long-tailed Chat. High Central Plains of United States to the Pacific; south into Mexico	12
53.—*Helminthophaga celata*. (Say,) Baird. Orange-crowned Warbler. Mississippi river to the Pacific; south to northern Mexico	2
54.—*Seiurus aurocapillus*, (Linn.) Sw. Golden-crowned Thrush. Eastern North America to the Missouri	8
55.—*Seiurus noveboracensis*, (Gm.) Nutt. Water Thrush. Eastern United States to the Missouri, and south to Guatemala, perhaps to Brazil	2
56.—*Dendroica coronata*, (Linn.) Gray. Yellow Rump. Eastern North America to the Missouri plains; stragglers seen on Puget's Sound	5
57.—*Dendroica audibonii*, (Towns.) Baird. Audubon's Warbler. Pacific coast of United States to Rocky mountains; south to Mexico	1
58.—*Dendroica pennsylvanica*, (Linn., Baird. Chestnut-sided Warbler. Eastern United States to the Missouri	1
59.—*Dendroica striata*, (Forster.) Baird. Black Poll Warbler. Eastern North America to the Missouri high plains; Cuba; Greenland	7
60.—*Dendroica aestiva*, (Gm.) Baird. Yellow Warbler. United States, from Atlantic to Pacific; south to Guatemala and West Indies	15
61.—*Dendroica maculosa*, (Gm.) Baird. Black and Yellow Warbler. Eastern United States to the Missouri; south to Guatemala	1
62.—*Setophaga ruticilla*, (Linn.) Sw. Redstart. Eastern United States to Fort Bridger; West Indies in winter	7
63.—*Pyranga ludoviciana*, (Wils.) Bon. Louisiana Tanager. From the Black Hills to the Pacific; south to Mexico.	2
64.—*Hirundo horreorum*, Barton. Barn Swallow. North America, from Atlantic to Pacific	3

	No. of specimens.
65.—*Hirundo lunifrons*, Say. Cliff Swallow. North America, from Atlantic to Pacific	4
66.—*Cotyle riparia*, (Linn.) Boie. Bank Swallow. North America generally	2
67.—*Progne purpurea*, (Linn.) Boie. Purple Martin. North America generally	13
68.—*Ampelis cedrorum*, (Vieill.) Baird. Cedar Bird. North America generally; south to Guatemala	2
69.—*Myiadestes townsendii*, (Aud.) Cab. Townsend's Flycatcher. United States, from Rocky mountains and Black Hills to the Pacific; south to the borders of Mexico	1
70.—*Collyrio borealis*, (Bon.) Baird. Great Northern Shrike. Northern regions, from Atlantic to Pacific; in winter south, through most of the United States	1
71.—*Collyrio excubitoroides*, (Sw.) Baird. White-rumped Shrike. Missouri plains and fur countries to Pacific coast; eastward into Wisconsin, Illinois, and Michigan (?)	6
72.—*Vireo gilvus*, (Vieill.) Bon. Warbling Flycatcher. Atlantic to Pacific coast of United States; var. *swainsonii;* Columbia river	6
73.—*Vireo (Lanivireo) solitarius*, (Wils.) Vieill. Blue-headed Flycatcher. United States, from Atlantic to the Pacific	2
74.—*Mimus carolinensis*, (Linn.) Gray. Cat Bird. Eastern United States to Fort Bridger	3
75.—*Oreoscoptes montanus*, (Towns.) Baird. Mountain Mocking Bird. Rocky mountains, from Fort Bridger south to Mexico; along valley of Gila and Colorado; San Diego, California	1
76.—*Harporhynchus rufus*, (Linn.) Cab. Brown Thrush. Eastern North America to Missouri river, and perhaps to High Central Plains, unless replaced by a long-tailed variety, *(H. Longicauda.)*	6
77.—*Salpinctes obsoletus*, (Say.) Cab. Rock Wren. High Central Plains, through the Rocky mountains to the Cascade range, (but not on the Pacific coast?) Fort Tejon	6
78.—*Cistothorus (Telmatodytes) palustris*, (Wils.) Cab. Long-billed Marsh Wren. North America, from Atlantic to Pacific; north to Greenland	2
79.—*Cistothorus (Cistothorus) stellaris*, (Licht.) Cab. Short-billed Marsh Wren. Eastern United States to the Loup Fork of Platte	1
80.—*Troglodytes aedon*, Vieill. House Wren. Eastern United States to the Missouri, or to the High Central Plains	1

No. of specimens.

81.—*Troglodytes parkmanni*, Aud. Parkman's Wren. Western America, from the High Central Plains and upper Missouri to the Pacific 13

82.—*Sitta canadensis*, Linn. Red-bellied Nuthatch. North America to the Rocky mountains, probably also to the Pacific 3

83.—*Polioptila caerulea*, (Linn.) Sclat. Blue-Gray Fly-catcher. United States, from Atlantic to Missouri, and on the southern border from the Gulf of Mexico to the Coast mountains of California, south to Guatemala 1

84.—*Lophophanes bicolor*, (Linn.) Bon. Tufted Titmouse. Eastern North America to the Missouri river, or else replaced there by a *L. missuriensis* 1

85.—*Parus septentrionalis*, Harris. Long-tailed Chickadee. Missouri river to the Rocky mountains, or else replaced there by *P. albescens* 4

86.—*Eremophila cornuta*, (Wils,) Boie. Sky Lark. Everywhere on the prairies and desert plains of North America; Atlantic States in winter. A smaller variety on the western plains 12

87.—*Carpodacus purpureus*, (Gm.) Gray. Purple Finch. North America, from Atlantic to the High Central Plains 1

88.—*Chrysomitris tristis*, (Linn.) Bon. Yellow Bird. North America generally 5

89.—*Chrysomitris pinus*, (Wils.) Bon. Pine Finch. North America, from Atlantic to Pacific 2

90.—*Curvirostra americana*, Wils. Red Crossbill. North America generally, coming southward in winter. Resident in the mountains of Pennsylvania. Perhaps var. *mexicana* in Rocky mountains 2

91.—*Curvirostra leucoptera*, (Gm.) Wils. White-winged Crossbill. Northern parts of North America generally 2

92.—*Plectrophanes (Centrophanes) ornatus*, Towns. Chestnut-collared Bunting. Plains of the upper Missouri .. 5

93.—*Plectrophanes (Centrophanes) melanomus*, Baird. Eastern slope of the Rocky mountains; Mexico, on the table-lands 3

94.—*Plectrophanes (Rhynchophanes) maccownii*, Lawr. Eastern slopes of Rocky mountains; from Fort Thorn, N. M., as far east as the Black Hills, north of the Platte 3

95.—*Passerculus savanna*, (Wils.) Bon. Savannah Sparrow. Eastern North America to the Missouri plains 5

96.—*Pooecetes gramineus*, (Gm.) Baird. Grass Finch. United States, from the Atlantic to the Pacific; or else one species to the High Central Plains, and another from this to the Pacific. 10

No. of specimens.

97.—*Coturniculus passerinus*, (Wils.) Bon. Yellow-winged Sparrow. Eastern United States to the High Central Plains (Loup Fork); also along the valley of Gila and Colorado 12

98.—*Coturniculus henslowi*, (Aud.) Bon. Henslow's Bunting. Eastern United States as far north as Washington; westward to the Loup Fork of Platte 1

99.—*Chondestes grammaca*, (Say.) Bon. Lark Finch. From Wisconsin and the prairies of Michigan to Pacific coast; south to Texas and Mexico on the plains ... 19

100.—*Zonotrichia leucophrys*, (Forster,) Sw. White-crowned Sparrow. United States, from Atlantic to the Rocky mountains, where they become mixed up with *Z. gambelii;* Greenland 3

101.—*Zonotrichia gambelii*, (Nutt.) Gambel. Rocky mountains to the Pacific coast; Fort Bridger 2

102.—*Zonotrichia querula*, (Nutt.) Gamb. Harris' Finch. Missouri river, above Fort Leavenworth 2

103.—*Zonotrichia albicollis*, (Gm.) Bon. White-throated Sparrow. Eastern United States to the Missouri 13

104.—*Junco oregonus*, (Towns.) Sclat. Oregon Snow Bird. Pacific coast of the United States to the eastern side of the Rocky mountains; stragglers as far east as Fort Leavenworth in winter, and Great Bend of Missouri 2

105.—*Junco caniceps*, (Woodh.) Baird. Rocky mountains, from Black Hills to Fort Bridger and San Francisco; mountains of New Mexico 2

106.—*Junco hyemalis*, (Linn.) Sclat. Snow Bird. Eastern United States to the Missouri, and as far west as Black Hills 3

107.—*Spizella monticola*, (Gm.) Baird. Tree Sparrow. Eastern North America to the Missouri; also on Pole creek and Little Colorado river, New Mexico 2

108.—*Spizella pusilla*, (Wils.) Bon. Field Sparrow. Eastern North America to the Missouri river 5

109.—*Spizella socialis*, (Wils.) Bon. Chipping Sparrow. North America, from Atlantic to Pacific 2

110.—*Spizella pallida*, (Sw.) Bon. Clay-colored Bunting. Upper Missouri river and High Central Plains to the Saskatchewan country 5

111.—*Melospiza (Melospiza) melodia*, (Wils.) Baird. Song Sparrow. Eastern United States to the High Central Plains 2

112.—*Melospiza (Helospiza) lincolnii*, (Aud.) Baird. Lincoln's Finch. United States, from Atlantic to Pacific, and south through Mexico to Guatemala 9

113.—*Melospiza (Helospiza) palustris*, (Wils.) Baird. Swamp Sparrow. Eastern United States, from the Atlantic to the Missouri 1

No. of specimens.

114.—*Calamospiza bicolor*, (Towns.) Bon. Lark Bunting. High Central Plains to the Rocky mountains; southwesterly to valley of Mimbres and Sonora 5

115.—*Euspiza americana*, (Gm.) Bon. Black-throated Bunting. United States, from the Atlantic to the border of the High Central Plains 17

116— .*uiraca (Goniaphea) ludoviciana*, (Linn.) Sw. Rose-breasted Grosbeak. Eastern United States to the Missouri plains; south to Guatemala 4

117.—*Guiraca (Goniaphea) melanocephala*, Sw. Black-headed Grosbeak. High Central Plains, from Yellowstone to the Pacific; table lands of Mexico 5

118.—*Guiraca caerulea*, (Linn.) Sw. Blue Grosbeak. More southern United States, from Atlantic to Pacific; south to Mexico 3

119.—*Cyanospiza amoena*, (Say,) Baird. Lazuli Finch. High Central Plains to the Pacific 6

120.—*Cardinalis virginianus*, Bonaparte. Red Bird. More southern portions of the United States to the Missouri; probably along valley of Rio Grande to Rocky mountains 1

121.—*Pipilo erythrophthalmus*, (Linn.) Vieill. Ground Robin. Eastern United States to the Missouri river 9

122.—*Pipilo arcticus*, Sw. High Central Plains of upper Missouri, Yellowstone and Platte; Fort Bridger ... 15

123.—*Pipilo chlorurus*, (Towns.) Baird. Blanding's Finch. Valley of Rio Grande and Gila. Rocky mountains north to the South Pass; south to Mexico 3

124.—*Dolichonyx oryzivorus*, (Linn.) Sw. Boblink. Eastern United States to Fort Bridger, Utah 3

125.—*Molothrus pecoris*, (Gm,) Sw. Cow Bird. United States, from the Atlantic to California; Fort Bridger 7

126.—*Agelaius phoeniceus*, (Linn.) Vieill. Swamp Blackbird. United States, from Atlantic to Pacific 9

127.—*Xanthocephalus icterocephalus*, (Bon.) Baird. Yellow-headed Blackbird. Western America, from Texas, Illinois, Wisconsin, and North Red river to California; south into Mexico; Greenland 2

128.—*Sturnella magna*, (Linn.) Sw. Meadow Lark. Eastern United States to the High Central Plains; south to Mexico; Cuba? 3

129.—*Sturnella neglecta*, Aud. Western Lark. Western America, from High Central Plains to the Pacific; east to Pembina, and perhaps to Wisconsin 22

130.—*Icterus spurius*, (Linn.) Bon. Orchard Oriole. United States, from the Atlantic to the High Central Plains; probably throughout Texas; south to Guatemala 12

No. of specimens.

131.—*Icterus baltimore*, (Linn.) Daudin. Baltimore Oriole. From Atlantic coast to the High Central Plains, and in their borders; south to Guatemala 9

132.—*Icterus bullockii*, (Sw.) Bon. Bullock's Oriole. High Central Plains to the Pacific; rare on upper Missouri; south into Mexico 1

133.—*Scolecophagus ferrugineus*, (Gm.) Sw. Rusty Blackbird. From Atlantic coast to the Missouri 1

134.—*Scolecophagus cyanocephalus*, (Wagl.) Cab. Brewer's Blackbird. High Central Plains to the Pacific; south to Mexico; Pembina, Minnesota 5

135.—*Quiscalus versicolor*, (Linn.) Vieill. Crow Blackbird. Atlantic to High Central Plains; Fort Bridger ... 7

136.—*Corvus carnivorus*, Bartram. American Raven. Entire continent of North America; rare east of the Mississippi 4

137.—*Corvus americanus*, Aud. Common Crow. North America to the Missouri region; also on the coast of California? (Not found on the High Central Plains?) 5

138.—*Picicorvus columbianus*, (Wils.) Bon. Clark's Crow. From Rocky mountains to Pacific; east to Fort Kearney 6

139.—*Pica hudsonica*, (Sabine.) Bon. Magpie. Arctic regions of North America; the United States, from the High Central Plains to the Pacific, north of California 15

140.—*Cyanura macrolophus*, Baird. Long-crested Jay. Central line of Rocky mountains to the table lands of Mexico 2

141.—*Perisoreus canadensis*, (Linn.) Bon. Canada Jay. Northern America into the northern parts of the United States, from Atlantic to Pacific; further south in Rocky mountains 9

142.—*Ectopistes migratoria*, (Linn.) Sw. Wild Pigeon. North America to High Central Plains 3

143.—*Zenaidura carolinensis*, (Linn.) Bon. Common Dove. Throughout United States, from Atlantic to Pacific; Cuba 1

144.—*Tetrao obscurus*, Say. Dusky Grouse. Black Hills of Nebraska to Cascade mountains of Oregon and Washington 6

145.—*Centrocercus urophasianus*, (Bon.) Sw. Cock of the Plains. Sage plains of the northwest 4

146.—*Pedioecetes phasianellus*, (Linn.) Baird. Sharp-tailed Grouse. Northern prairies and plains, from Wisconsin to Cascades of Oregon and Washington ... 5

No. of specimens.

147.—*Cupidonia cupido*, (Linn.) Baird. Prairie Hen. Western prairies and plains, within the limits of the United States, east of the Rocky Mountains; southeast to Calcasieu, Louisiana; east to Pocono mountains; Pennsylvania, Long Island, and eastern coast 3

148.—*Ortyx virginianus*, (Linn.) Bon. Partridge; Quail. Eastern United States to the High Central Plains. 1

149.—*Grus americanus*, (Linn.) Ord. Whooping Crane. Florida and Texas; stragglers in Mississippi valley 1

150.—*Ardea herodias*, Linn. Great Blue Heron. Throughout the entire territory of the United States; West Indies 1

151.—*Botaurus lentiginosus*, Steph. Bittern. Entire continent of North America 2

152.—*Chanadrius vociferus*, (Linn.) Cassin. Killdeer. North America to the Arctic regions; Mexico; South America 5

153.—*Aegialitis (Oxychus) vociferus*, (Linn.) Cassin. Killdeer. North America to the Arctic regions; Mexico; South America 4

154.—*Aegialitis (Oxyechus) montanus*, (Towns.) Cassin. Mountain Plover. Western North America; Fort Bridger and Fort Tejon 5

155.—*Aegialitis (Aegialeus) melodus*, (Ord.) Cab. Piping Plover. Eastern coast of North America; Nebraska; Louisiana 5

156.—*Recurvirostra americana*, Gm. American Avoset. All of temperate North America; Florida 2

157.—*Phalaropus wilsonii*, Sab. Wilson's Phalarope. Entire temperate regions of North America; New Mexico 7

158.—*Philohela minor*, (Gm.) Gray. American Woodcock. Eastern North America 1

159.—*Gallinago wilsonii*, (Temm.) Bon. English Snipe. Entire temperate regions of North America; California 4

160.—*Tringa (Actodromas) wilsonii*, Nuttall. Least Sandpiper. Entire temperate North America 1

161.—*Tringa (Actodromas) bonapartii*, Schlegel. North America, east of the Rocky mountains 2

162.—*Ereunetes petrificatus*, Ill. Semipalmated Sandpiper. Entire temperate regions of North America; South America; varying much in size 4

163.—*Gambetta melanoleuca*, (Gm.) Bon. Tell-tale. Stone Snipe. Entire temperate regions of North America. Mexico 2

164.—*Rhyacophilus solitarius*, (Wils.) Bon. Solitary Sandpiper. Entire temperate regions of North America. Mexico 6
165.—*Tringoides macularius*, (Linn.) Gray. Spotted Sandpiper. Entire temperate North America; Oregon. Accidental in Europe 3
166.—*Actiturus bartramius*, (Wils.) Bon. Field Plover. Eastern North America; South America. Europe. 8
167.—*Limosa fedoa*, (Linn.) Ord. Entire temperate regions of North America. South America 2
168.—*Numenius (Phaeopus) borealis*, (Forst.) Latham. Esquimaux Curlew. Eastern and northern North America 3
169.—*Porzana (Porzana) carolina*, Vieill. Common Rail. Entire temperate regions of North America 1
170.—*Fulica americana*, Gmelin. Coot. Entire temperate regions of North America 2
171.—*Cygnus buccinator*, Rich. Trumpeter Swan. Western America, from the Mississippi valley to the Pacific 1
172.—*Bernicla (Leucoblepharon) canadensis*, (Linn.) Boie. Canada Goose. Whole of North America. Accidental in Europe 1
173.—*Anas boschas*, Linn. Mallard. Entire continent of North America and greater part of Old World 1
174.—*Dafila acuta*, (Linn.) Jenyns. Sprig-tail; Pin-tail. Whole of North America and Europe 1
175.—*Nettion crecca*, (Linn.) Kaup. English Teal. Europe; accidental on the eastern coast of the United States, 2
176.—*Querquedula discors*, (Linn.) Steph. Blue-winged Teel. Eastern North America to Rocky mountains. Not yet found on the Pacific coast, nor in Europe. 3
177.—*Apatula clypeata*, (Linn.) Boie. Shoveller. Continent of North America; abundant in Europe 1
178.—*Mareca americana*, (Gm.) Stephens. Baldpate; American Widgeon. Continent of North America; accidental in Europe 1
179.—*Aix sponsa*, (Linn.) Boie. Summer Duck. Continent of North America 5
180.—*Erismatura rubida*, (Wils.) Bon. Ruddy Duck. Whole of North America; abundant throughout the interior 2
181.—*Mergus americanus*, Cass. Sheldrake. Whole of North America 1
182.—*Lophodytes cucullatus*, (Linn.) Reich. Hooded Merganser. Whole of North America 1
183.—*Larus delawarensis*, Ord. The Ring-billed Gull. Arctic America; Texas to Labrador; western rivers; northwest coast 1

184.—*Sterna frenata*, Gambel. The Least Tern. Texas to Labrador; western rivers 3
185.—*Hydrochelidon plumbea*, (Wils.) The Short-tailed Tern. Texas to the New England States: Mississippi rivers and tributaries; fur countries 1
186.—*Podiceps californicus*, Heermann. California Grebe. Western North America 2

FISHES.

A series of the principal fishes inhabiting the Missouri and its tributaries, were collected and preserved in alcohol, and are now deposited in the museum of the Smithsonian Institution. A portion are still undescribed, and of those already determined, Dr. Girad has very kindly furnished me the following list:

1. *Stizostedion boreus*, Grd. Fort Union, Mo.
2. *Gasterosteus inconstans*, Kirtl. Yellowstone river.
3. *Amblodon grunniens*, Rafin. Milk river.
4. *Pimelodus olivaceus*, Grd. Yellowstone river.
5. *Noturus flavus*, Rafin. Yellowstone river.
6. *Carpiodes damalis*, Grd. Fort Pierre.
7. *Ptychostomus Haydeni*, Grd. Yellowstone river.
8. *Acomus griseus*, Grd. Platte river.
9. *Acomus lactarius*, Grd. Milk river.
10. *Catostomus Sucklii*, Grd. Milk river.
11. *Pimephales fasciatus*, Grd. Milk river.
12. *Hybognathus argyritis*, Grd. Milk river.
13. *Hybognathus Evansi*, Grd. Fort Pierre.
14. *Argyreus dulcis*, Grd. Sweet water.
15. *Pogonichthys communis*, Grd. Milk river.
16. *Gobio gelidus*, Grd. Milk river.
17. *Leucosomus dissimilis*, Grd. Milk river.
18. *Leucosomus macrocephalus*, Grd. Fort Pierre.
19. *Nocornis nebrascensis*, Grd. Sweet water.
20. *Semotilus speciosus*, Grd. Platte river.
21. *Plargyrus bowmani*, Grd. Sweet water.
22. *Hyodon tergisus*, Lesu. Fort Sarpy, Yellowstone.
23. *Scaphirhynchus platyrhynchus*, Baird. Upper Mo.
24. *Polyodon folium*, Lacep. Fort Pierre.

REPTILES.

A large collection of reptiles was made from all parts of the upper Missouri, and it is probable that the following list represents quite fully that portion of the Nebraska fauna. The species have been

identified by Professor Baird and Mr. R. Kennicott, and the specimens are deposited in the museum of the Smithsonian Institution.

1. *Trionyx*. Yellow-stone river.
2. *Emys elegans*. Yellow-stone river.
3. *Emys*. Mouth Powder river.
4. *Cistudo*. Mouth Powder river.
5. *Crotalus confluentus*, Say. Yellow-stone river.
6. *Crotalophorus tergeminus*, Holb. Yellow-stone river.
7. *Entainia sirtalis*, var. *parietalis*, B. & G. Loup Fork.
8. *Entainia*. Sand Hills.
9. *Nerodia sipedon*, B. & G. Yellow-stone river.
10. *Heterodon nasicus*, B. & G. Sand Hills of Loup Fork.
11. *Pituophis sayi*, B. & G. Sand Hills of Loup Fork.
12. *Amphibolus sayi*. Fort Benton, on Missouri river.
13. *Bascanion flaviventris*. Head of Loup Fork.
14. *Chlorosoma vernalis*. Yellow-stone river.
15. *Scelophorus consobrinus*.
16. *Scelophorus graciosus*.
17. *Holbrookia maculata*.
18. *Holbrookia douglassi*.
19. *Cnemidophorus sexlineatus*.
20. *Plestiodon leptogrammus*.
21. *Plestiodon multivirgatum*.
22. *Plestiodon inornatum*.
23. *Plestiodon septentrionalis*.
24. *Rana halecina*.
25. *Bufo americanus*.
26. *Bufo cognatus*.
27. *Bufo woodhousi*.
28. *Siredon*.

RECENT MOLLUSCA.

An interesting series of recent fluviatile and land Mollusca were secured during the several expeditions from various portions of the upper Missouri. The fresh water shells were very kindly examined by Mr. Isaac Lea, the celebrated conchologist, of Philadelphia. In some remarks before the Philadelphia Academy in regard to the above collection, and one obtained by Mr. Kennicott from the Red river of the north, Mr. Lea says:

"It is not to be understood that either of these collections, made under adverse circumstances, and at times of great personal danger, should be full representatives of this branch of the fauna of these countries. But they are sufficient to prove that zoological life, so far as represented by molluscs, is nearly, if not quite the same, as that of the Ohio river basin, as well as that of the Missouri river and a part of the lower Mississippi and Red river of the south. The knowledge of a part of the species from these remote districts proves to us the wide spread distribution of the same species, as we find every one of them in the Ohio river at Cincinnati, Marietta, and Pittsburg, and

this is the more remarkable, as the waters of the Red river of the north are embraced in a different system of drainage, flowing as they do into Hudson's bay at about 52° north latitude. Here is seen an immense area of country producing in its waters nearly the same life as regards the molluscs, a fact highly interesting to the zoologist."

To Mr. W. G. Binney were transmitted the land shells, which were examined by him with great care. I quote the following remarks from his letter: "These shells are all of value, as they form the first contribution to our knowledge of the species found in those regions. They are, however, for the most part alluvial. *Succinea Haydeni* is the only perfectly fresh species, the animal being preserved in alcohol."

"*Helix costata* was found in myriads, probably the contribution of many small streams above. Of the previously known species it is the most interesting, having been noticed previously in few localities and small numbers. If any argument were needed to establish the point of *H. minuta* (Say) being identical with the European *H. pulchella* (Mull.) it might be found in the fact of the ribbed variety being also found in this country."

The following catalogue comprises all the freshwater and land shells known to us on the upper Missouri:

FLUVIATILE SHELLS.

1. *Unio alatus*, Say. Big Sioux river.
2. *Unio levississimus*, Lea. Big Sioux river.
3. *Unio luteolus*, Lam. " "
4. *Unio asperimus*, Lea. " "
5. *Unio rectus*, Lea. " "
6. *Unio elegans*, Lea. James river.
7. *Unio zizzag*, Lea. White Earth river.
8. *Unio anadontoides*, Lea. James river.
9. *Magaritana complanata*, Lea. Fort Clark, in Missouri.
10. *Anadonta Ferussaciana*, Lea. White river, Nebraska.
11. *Lymnea elodes*, Say. Mouth Big Sioux river.
12. *Lymnea nuttalliana*, Lea. " "
13. *Lymnea humilis*, Say. " "
14. *Lymnea Haydeni*, Lea. " "
15. *Lymnea Kirtlandiana*, Lea. " "
16. *Lymnea umbrosa*, Say. Grindstone creek, Nebraska Territory.
17. *Lymnea lubricoides*, Lea. " "
18. *Lymnea Philadelphica*, Lea. " "
19. *Planorbis bicarinatus*, Say. Mouth Big Sioux river.
20. *Planorbis trivolvis*, Say. " "
21. *Planorbis lentus*, Say. " "
22. *Planorbis parvus*, Say. " "
23. *Planorbis campanulatus*, Say. " "
24. *Physa heterostropha*. " "
25. *Physa integra?* Hald. " "
26. *Physa elongata*, Say. " "
27. *Physa ampularia*, Say. " "

28. *Psidium*—? Grindstone creek.
29. *Cyclas*—? " "
30. *Daphnia*—? " "
31. *Amnicola porata*, Say. Fort Berthold.
32. *Amnicola lapidaria*, Say. "

LAND SHELLS

33. *Helix minuscula*, Binney. Council Bluffs, Nebraska Territory.
34. *Helix lineata*, Say. " "
35. *Helix striatella*, Anthony. Council Bluffs, Nebraska Territory.
36. *Helix inflecta*, Say. " "
37. *Helix hirsuta*, Say. " "
38. *Helix solitaria*, Say. " "
39. *Helix alternata*, Say. " "
40. *Helix elevata*, Say. " "
41. *Helix fallax*, Say. " "
42. *Helix concava*, Say. " "
43. *Helix ligera*, Say. " "
44. *Helix profunda*, Say. Near Fort Leavenworth, Kansas Territory.
45. *Helix multilineata*, Say. " "
46. *Helix monodon*, Rackett. " "
47. *Helix pulchella*, Mull. " "
48. *Helix costata*, Mull. " "
49. *Helix arborea*, Say. Drift on the Missouri, near Fort Berthold.
50. *Helix cheresina*, Say. " "
51. *Helix electrina*, Gould. " "
52. *Helix cooperi*, (new spec.,) Binney. Black Hills, Nebraska Territory.
53. *Pupa nebraskana*, (new spec.,) W. G. Binney. Fort Berthold, Nebraska Territory.
54. *Pupa blandi*, (new spec.,) W. G. Binney. Fort Berthold.
55. *Pupa armigera*, Say. "
56. *Pupa pentodon*, Say. Council Bluffs, Nebraska Territory.
57. *Pupa modesta*, Say. " "
58. *Pupa badia*, Adams. " "
59. *Bulimus lubricus*, Mull. Fort Berthold, on Missouri.
60. *Succinea venusta*, Say. Yellowstone.
61. *Succinea retusa*, Lea. "
62. *Succinea Haydeni*, (new spec.,) W. G. Binney. Yellowstone.
63. *Succinea lineata*, (new spec.,) W. G. Binney. Fort Union and Yellowstone.
64. *Succinea Nuttalliana*, Lea. Fort Union.
65. *Succinea obliqua*, Say. Fort Berthold, Nebraska Territory.

BOTANY.

The collection of recent plants from the upper Missouri is very large and numerous in species. Comparatively few of them have been determined and their names presented in this list. The complete catalogue, with the necessary remarks and descriptions of new species, will appear in the final report.

The vegetation of Kansas and the southern and southeastern portions of Nebraska is luxuriant in the highest degree. The broad bottom prairies of the Missouri, from Council Bluffs to the mouth of the Niobrara, are of inexhaustible fertility, sustaining a vegetation variable in its character and of enormous growth. The upland prairies possess a soil composed of yellow marl, well adapted to agriculture and grazing. All that portion of Nebraska which borders upon the Missouri, for one hundred to one hundred and fifty miles into the interior, is already settled to a great extent, and the traveller sees in prospective many of the finest farms in the west. The beautiful valley of the Platte cannot be surpassed for fertility of soil and the variety and luxuriance of its vegetation. Scarcely a section of land can be seen at the present time that is not already occupied by the courageous and persevering pioneer, and made to yield most abundant crops. Sufficient timber occurs along the banks of ravines and streams for all economical purposes. After passing above latitude 43°, the soil becomes less fertile, climate much drier, and vegetation less luxuriant. The whole country, though well adapted for the purposes of pasturage, is not well suited for agriculture, except in comparatively few localities. There is very little timber but that which skirts the streams, and consists for the most part of cottonwood, elm, ash, and box wood. Reaching the mountains, as the Bear's Paw, Snowy, Girdle, Black hills, or Laramie hills, an inexhaustible supply of pine timber is found, with many other varieties of trees common to the northern regions. The numerous broad valleys in the Black hills possess a very fertile soil and abound in springs of pure water, and the time cannot be far distant when this region as well as the country around Fort Laramie will be settled by a thriving population, and the vast forests of pine rendered serviceable to the wants of man.

That there is a marked improvement in the character of the country as we approach the mountains has already been noticed in published reports. The valley of the Yellowstone river, after passing the mouth of the Big Horn, is spoken of by both traders and Indians as quite fertile, abounding with excellent timber, fine clear springs of water, and a luxuriant vegetation. The Crows who now possess this region regard it as the finest country in the world. The immense beds of gypsum, of the Jurassic formation, along the eastern slope of the Rocky mountains, some of which are twenty feet in thickness, would furnish an inexhaustible supply of that excellent fertilizer.

Much might be said in regard to the influence of soil, climate, geological structure, &c., upon the vegetation of the upper Missouri, as well as the geographical distribution of species; but time will not

permit, though many facts have been gathered bearing upon these points. These will appear with the more complete catalogue when the final report is published.

The following meteorological notes were taken at Fort Pierre and vicinity in the spring of 1855, and though very brief may prove of some interest:

March 7.—Weather fair; grass starting up fresh and green near Black hills. Grasshoppers and ants quite active. Antelope returning to the open prairies from their winter home in the north.

March 8.—Weather very fine and warm. Saw common striped snake, (*Eutainia parietalis.*)

March 9.—Saw red-headed woodpecker, (*Melanerpes erythrocephalus.*) and in company with it a beautiful black glossy woodpecker about the same size, (*Melanerpes torquatus.*)

March 10.—Saw two fine plants on the south side of Bear Peak, six hundred feet above the level prairie around it. One of them *Anemone patens*, was in blossom, the other was just coming into bloom.

The ice broke up in the Missouri river March 6th, as far as Fort Clark, lat. 47°. Then came several days of stormy weather, during which the river was frozen over a second time so firm as to sustain heavily loaded teams. The ice again broke up on the 22d for about the same distance up the Missouri. At Fort Union the ice did not yield until the 3d of April.

April 9.—Four species of umbeliferous plants in bloom; heavy frost during the night, so that ice formed upon the little pools an inch in thickness; grasshoppers quite active and abundant.

April 10.—Cold; some snow.

April 11.—Fair weather; a strong breeze blowing though quite warm. A small species of *Carex* in blossom. Saw yellow-shafted flicker, (*Colaptes auratus,*) and meadow lark, (*Sturnella neglecta.*) At night the frogs commenced a gentle croaking, for the first time this spring.

April 12.—Various kinds of insects quite abundant; common garter snake, (*E. parietalis,*) killdeer, (*Charadrius vociferus,*) geese and ducks abundant; American elm (*Ulmus americana,*) in full bloom.

April 13.—Saw a large flock of swans, (*Cygnus buccinator:*) a beautiful *Ranunculus* in bloom, (*R. glaberrimus.*) The long-billed curlew (*Numenius longirostris,*) quite abundant running on the upland prairie.

April 16.—The 13-lined squirrel (*Spermophilus tridecem lineatus,*) quite abundant on the high prairie.

April 20.—Saw to-day, birds: wild geese, (*Anser erythropus,*) kingbird, (*Tyrannus crinitus,*) robin redbreast, *Turdus migratorius,*) (a few robins were seen near Fort Pierre, April 1st,) the meadow lark, flicker, killdeer, turkey buzzard, (*Cathartes aura,*) mourning dove, (*Ectopistes carolinensis,*) common cowbird, (*Molothrus pecoris,*) very abundant; also a gull (*Larus franklinii,*) was seen on the river. The following plants were in bloom: *Astragalus caryocarpus*, *Shepherdia argentea*, a species of *Salix*, *Populus angulata*, and a fine bluebell, *Mertensia virginica.*

April 23.—Red winged blackbird (*Agelaius phoeniceus*,) abundant. *Prunus americana* in bloom ; *Symphoricarpus occidentalis* and *Artemisia* in full foliage.

May 6.—Saw blue heron, (*Ardea herodias* ;) *Cornus stoloniferus* in bloom.

May 7.—Kingfisher (*Ceryle alcyon*,) seen on the Teton river.

May 8.—Saw cliff swallow (*Cotyle riparia* ;) also a large rattlesnake (*Crotalus confluentus* ;) *Castileia sessiliflora* in full bloom.

May 9.—*Senecio aureus*, a species of *Salix*, and a *Juncus* in full bloom.

May 10.—In the valley of White river the trees are in full foliage, and the bottom and upland prairies are covered with a rich green carpet of grass, and multitudes of plants are now in blossom. *Malvastrum coccineum* just coming into bloom. *Mammalaris nuttalli* and *Allium stellatum* are in full bloom.

May 12.—*Ranunculus aquatilis* in bloom. At this time, so many birds and flowers, strange to me, have made their appearance that I cannot indicate them. Spring has fairly arrived, and summer is approaching. During the month of May considerable rain fell, so that the streams were much swollen. But for six or eight months past we have had very little rain, not more than one or two inches. All the vegetation was parched with drought.

The "June rise" is said, by the mountaineers, to commence invariably at the time when the roses are in bloom. This year the roses were in blossom June 1st, though I saw some in flower May 14th in the White river valley. The rise in the waters of the Missouri commenced at Fort Pierre, June 11th, 4 inches the first day, 5 inches the second, 18 inches the third, 4 to 8 inches the fourth, and afterward falling gradually. This is usually called by the mountaineers the "big rise," and is due to the melting of the snows, which accumulate during the winter in the ravines and valleys of the mountains near the sources of the Missouri. There was comparatively little snow in the mountains last winter, and there has been very little rain during the spring, consequently the rise this year is quite small.

June 1.—*Yucca angustifolia*, *Polygala alba*, *Opuntia missouriensis*, are in full bloom. The cacti bear the most beautiful blossoms of any of the plants of the prairie.

The principal part of the plants enumerated in the following catalogue were identified by the distinguished botanist, Dr. George Engelmann, of St. Louis, Missouri. A few were determined by Dr. Torrey, and the remainder by the writer. A good collection of mosses, lichens and fungi was obtained, but the species have not yet been studied, though they will be ready for the final report. It will be seen therefore that no department of the geology and natural history of the upper Missouri has been neglected in our explorations.

1. *Clematis Virginiana*, Linn. Very abundant from the mouth of the Missouri to Council Bluffs.
2. *Clematis ligusticifolia*, Nutt. Fort Pierre to the mountains. Very abundant about Fort Union; also at Fort Laramie, head of the Platte.

3. *Pulsatilla patens*, D. C. This plant is called by the Indians the harbinger of spring. I saw it on the south side of Bear Peak, March 9, 1855, just coming into bloom. It is found quite abundantly in the White river valley; also in the sand hills of Loup Fork.
4. *Anemone Pennsylvanica*, Linn. Abundant from the mouth of the Missouri to the mountains, though most common below latitude 43°.
5. *Anemone Caroliniana*, Walt. Quite common around Council Bluffs to Niobrara river.
6. *Anemone cylindrica*, Gray. This plant is quite rare; only a few individuals were seen near the mouth of the Big Sioux river, and on Loup Fork.
7. *Ranunculus repens*, var *Marylandicus*, Torr. and Gray. Low, wet places on the Upper Missouri.
8. *Ranunculus Pennsylvanicus*, Linn. Council Bluffs; Niobrara; Platte valley.
9. *Ranunculus recurvatus*, Poir. Mouth of the Missouri to Niobrara river; also sparingly in White river valley.
10. *Ranunculus abortivus*, Linn. Wet and sandy places to Niobrara; sparingly to the mountains.
11. *Ranunculus sceleratus*, Linn. Not rare throughout the upper Missouri country.
12. *Ranunculus glaberrimus*, Hook. The only locality in which I ever saw this plant was at Grindstone Hills, near Bad Lands, where it was in bloom on the 9th of April.
13. *Ranunculus cymbalaria*, Pursh. Seen on the Yellowstone and Missouri.
14. *Ranunculus aquatilis*, Linn. Very abundant in the White river valley, in the streams, and little lakes.
15. *Myosurus minimus*, Linn. Missouri bottoms, opposite St. Joseph's; also on the upland prairie, near Fort Pierre.
16. *Aquilegia Canadensis*, Linn. Does not extend above Council Bluffs or the Big Sioux.
17. *Isopyrum biternatum*, Torr. and Gray. Seen sparingly as far up the Missouri as the mouth of the Platte.
18. *Delphinium tricorne*, Mich. Extends to the mouth of the Big Sioux; range to Niobrara, in latitude 43°.
19. *Delphinium azureum*, Mich. Abundant on the open prairies to the mountains.
20. *Delphinium virescens*, Nutt. Fort Pierre.
21. *Thalictrum cornuti*, Linn. Not rare to mountains.
22. *Thalictrum dioicum*, Linn. Abundant to Niobrara river.
23. *Hydrastis Canadensis*, Linn. Found only in the carboniferous limestone region to Council Bluffs; perhaps rarely to Big Sioux river.
24. *Actea rubra*, Bigelow. Council Bluffs.
25. *Asimina triloba*, Dunal. Common Papaw. Extends up the Missouri to the mouth of the Big Sioux river.

26. *Menispermum Canadensis*, Linn. Most abundant in the limestone regions to Council Bluffs; seen rarely on wooded banks to the Yellow-stone.
27. *Berberis aquifolium*, Pursh. A very abundant shrub in the Laramie range of hills and Black Hills.
28. *Podophyllum peltatum*, Linn. Abundant along the lower part of the Missouri river, gradually ceasing at the mouth of the Platte.
29. *Nelumbeum luteum*, Willd. Lower portion of the valley of the Platte, and on the broad, wet bottoms about Omaha city. It is now quite rare on account of the great use of both roots and seeds for food, by the Omaha, Otoe, and Pawnee Indians.
30. *Nymphea odorata*, Sit. Found by Dr. Cooper in Kansas.
31. *Argemone Mexicana*, Linn. Found only at Bellevue, Nebraska Territory; fine yellow flowers.
32. *Argemone hispida*, Gray. Bad Lands, White river, Loup Fork, Fort Laramie.
38. *Sanguinaria Canadensis*, Linn. Rich woods about Council Bluffs.
34. *Corydalis aurea*,, Willd. Not seen on the bottoms to mountains.
35. *Dicentra cucullaria*, D. C. In shady woods to mouth Big Sioux.
36. *Nasturtium palustre*, D. C. Not uncommon to mountains.
37. *Nasturtium obtusum*, Nutt. On the upper Missouri and Yellowstone.
38. *Nasturtium sinuatum*, Nutt. Fort Clark, Upper Missouri.
39. *Nasturtium sesiliflorum*, Nutt. Along Missouri.
40. *Nasturtium limosum*, Nutt. Along low bottoms near to Council Bluffs.
41. *Dentaria laciniata*, Muhl. Shady woods around Council Bluffs.
42. *Nasturtium calycinum*, Engelmann: nov. sp.

Annuum erectum seu diffusum, hirsutulum; folis caulinis anguste oblongis sinuatis seu subpinnatifidis basi auriculata arcte sessilibus vel semi amplexicaulibus; racemis confertifloris demum elongatis; pedicellis flore flavido et silicula ovoidea acuta parva hispidula cum stylo gracilis vix longioribus; calyce persistente.

Sandy bottoms of the Yellowstone river, Fort Sarpy to Fort Union.—In aspect as well as in the style, (fully a line long on a siicle $1\frac{1}{2}$ line in length,) this species resembles some *vesicariae*, but the numerous seeds are those of a *nasturtium*. The stem is about a foot high, often much branched and diffuse. The ovate lanceolate acutish sepals commonly persist until the valves of the pod have fallen. The pubescence of the pod consists of very short and pointed thick-based simple hairs. (A. Gray.)

43. *Arabis Canadensis*, Linn. Common along Missouri to Fort Union.
44. *Arabis hirsuta*, Scop. Fort Union and Bad Lands.
45. *Arabis laevigata*, D. C. Shady woods to mouth of Platte.
46. *Arabis dentata*, Torr. and Gray. Council Bluffs.
47. *Sisymbrium canescens*, Nutt. Fort Pierre and Yellowstone.

48. *Erysimum asperum*, D. C. Abundant on the high prairies to Fort Pierre and Fort Union.
49. *Erysimum cheiranthoides*, Linn. Yellowstone and Bad Lands.
50. *Stanleya pinnatifida*, Nutt. Abundant on the marl banks near Niobrara river, Fort Pierre, rarely on the Yellowstone.
51. *Stanleya integrifolia*, James. Dr. Gray thinks it is a different form of last species.
52. *Vesicaria ludoviciana*, D. C. Sterile hills, Fort Pierre, and Yellowstone.
53. *Vesicaria alpina*, Nutt. Same as preceding.
54. *Vesicaria didymocarpa*, Hook. Bad Lands.
55. *Sinapis nigra*, Linn. About old houses and cultivated fields, Council Bluffs, and Fort Pierre.
56. *Capsella bursa-pastoris*, Linn. Same as preceding.
57. *Draba micrantha*, Nutt. Bad Lands.
58. *Draba Caroliniana*, Walt. Council Bluffs.
59. *Draba brachycarpa*, Nutt. Lower Missouri.
60. *Lepidium ruderale*, Linn. Along Missouri to mountains.
61. *Lepidium Virginicum*, Linn. Fort Pierre and Yellowstone.
62. *Cleome integrifolia*, Torr. and Gray. Bad Lands, Fort Union, Yellowstone, Bad Lands of Judith, Platte valley, Fort Laramie, and not a generally diffused plant, but growing abundantly in localities.
63. *Polanisia uniglandulosa*, Gray. First seen on gravelly hills about Fort Pierre; also on Loup Fork.
64. *Viola palmata*, Linn. Fort Pierre.
65. *Viola cucullata*, Sit. Fort Pierre.
66. *Viola Nuttallii*, Pursh. Bad Lands.
67. *Viola Canadensis*, Linn. Fort Pierre.
68. *Viola tricolor*, Linn. Council Bluffs.
69. *Viola delphinifolia*, Nutt. Prairies around Council Bluffs.
70. *Silene antirrhina*. Linn. Council Bluffs.
71. *Silene stellata*, Ait. Dixon's Bluffs.
72. *Alsine Michauxi*, Fenzl. Mouth Big Sioux.
73. *Cerastium nutans*. Raf. White river, Bad Lands.
74. *Cerastium arvense*, Linn. Council Bluffs.
75. *Moehringia lateriflora*, Linn. Along Missouri to Council Bluffs.
76. *Paronychia sessiliflora*, Nutt. Fort Union, Laramie Peak, Black Hills.
77. *Stellaria longipes*, Goldie. Council Bluffs.
78. *Portulaca oleracea*, Linn. On saline clay soil, Teton river, near Fort Pierre; also near base of Black Hills, (indigenous.)
79. *Claytonia Virginica*, Linn. Rocky woods, as high up the Missouri as Council Bluffs.
80. *Abutilon avicennae*, Gaertn. Naturalized near Council Bluffs.
81. *Malvastrum coccineum*, Gray. Makes its appearance on the Missouri about latitude 43°, and continues to the mountains.
82. *Tilia Americana*, Linn. Abundant to Big Sioux; seen sparingly to mouth of Niobrara, where it ceases.
83. *Linum rigidum*, Pursh. Throughout the prairie portion of the upper Missouri.

84. *Linum perenne*, Linn. Fort Pierre and Fort Union.
85. *Linum bootti*, Planchon. Found by Dr. Cooper in Kansas.
86. *Oxalis stricta*, Linn. Generally diffused.
87. *Oxalis violacea*, Linn. Rich prairies and cultivated fields around Council Bluffs; seen nearly as high as Niobrara, in full bloom June 20, 1857.
88. *Oxalis corniculata*, Linn. Upper Mo.
89. *Geranium maculatum*, Linn. Common to Niobrara.
90. *Geranium carolinianum*, Linn. Mouth Big Sioux
91. *Impatiens pallida*, Nutt. Shady woods to mountains.
92. *Impatiens fulva*, Nutt. Council Bluffs and Big Sioux.
93. *Xanthoxylum Americanum*, Mill. Woody bottoms, and islands of the Mo., to Fort Pierre.
94. *Ptelia trifoliata*, Linn. Around Council Bluffs.
95. *Rhus glabra*, Linn. Council Bluffs White river valley.
96. *Rhus copallina*, Linn. Abundant in Mo., and Kansas.
97. *Rhus toxicodendron*, Linn. Abundant in woody places to the mountains.
98. *Rhus aromatica*, Ait. Along Mo.
99. *Rhus trilobata*, Nutt. First makes its appearance about lat., 43°, and occurs abundantly on sterile hills to the mountains.
100. *Vitis riparia*, Michx. Banks of Mo., Bellevue, N. T.
101. *Vitis indivisa*, Willd. Big Sioux river.
102. *Ampelopsis quinquefolia*, Michx. Very common in woody bottoms throughout the country, but grows most luxuriant in the rich woods from mouth of Missouri to Big Sioux, where it often so clothes old dry trees that they seem still alive.
103. *Rhamnus lanceolatus*, Pursh. Council Bluffs.
104. *Ceanothus sanguineus*, Pursh. Mouth of White river.
105. *Ceanothus ovalis*, Bigelow, var. *pubescens*. Common on the cretaceous hills below Fort Pierre; also in the sand hills of Loup Fork, on the Niobrara river.
106. *Celastrus scandens*, Linn. Along Missouri to Fort Union.
107. *Euonymus atropurpureus*, Jacq. Woody bottoms to Fort Union.
108. *Euonymus Americanus*, Linn. Mouth of Platte.
109. *Staphylea trifolia*, Linn. Council Bluffs.
110. *Æesculus glabra*, Willd. Missouri bottoms to Big Sioux river.
111. *Acer dasycarpum*, Ehshart. Bellevue, Nebraska.
112. *Acer rubrum*, Linn. Highest limit on Missouri, latitude 42°.
113. *Acer saccharinum*, Wang. Limestone regions of Kansas and southern portion of Nebraska.
114. *Negundo aceroides*, Moench. One of the few trees which extends to the mountains.
115. *Polygala alba*, Nutt. On sterile hills to Fort Union.
116. *Polygala verticillata*, Linn. Moist places on prairies; Fort Pierre; Bad lands.
117. *Polygala senega*, Linn. Council Bluffs.
118. *Vicia Americana*, Muhl. Upper Missouri generally.
119. *Lathyrus linearis*, Nutt. Upper Missouri generally.

120. *Lathyrus polymorphus*, Nutt. White river valley.
121. *Lathyrus venosus*, Muhl. Rich bottoms, Big Sioux.
122. *Phaseolus pauciflorus*, Benth. Bad Lands.
123. *Amphicarpea monoica*, Nutt. White river valley, Fort Clark.
124. *Apios tuberosa*, Moench. Along sandy woody bottoms of Missouri. A species of mouse gathers large numbers of the tubers of this plant for his winter store. These "cachés," (as they are called,) are eagerly sought by the squaws, and the tubers taken and used as food. I have seen several bushels of the roots in a single lodge. Cooked with buffalo meat they make a very palatable dish.
125. *Glycyrhiza lepidota*, Nutt. Diffused generally.
126. *Psoralea lanceolata*, Pursh. From Bellevue to Yellowstone.
127. *Psoralea floribunda*, Nutt. Big Sioux river to Bad Lands.
128. *Psoralea campestris*, Nutt. Bad Lands.
129. *Psoralea argophylla*, Pursh. A most beautiful plant, covering the plain as with silvery velvet. Big Sioux to mountains.
130. *Psoralea cuspidata*, Pursh. Fort Pierre to Bad Lands.
131. *Psoralea esculenta*, Pursh. Affords the Indians a very nourishing farinaceous root, upon which they subsist almost entirely in the spring and early summer months, when game is scarce. It is also a great favorite of the grizzly bear.
132. *Amorpha fruticosa*, Linn. A common shrub, above Missouri to mountains.
133. *Amorpha canescens*, Nutt. Very abundant on the upland prairies, Loup Fork, and Niobrara river.
134. *Amorpha nana*, Nutt. Fort Laramie and high up the Missouri.
135. *Dalea aurea*, Nutt. Bad Lands.
136. *Dalea alopecuroides*, Willd. Big Sioux river.
137. *Dalea laxiflora*, Pursh. Fort Pierre to Yellowstone.
138. *Petalostemum candidum*, Mich. Big Sioux river.
139. *Petalostemum multiflorum*, Nutt. Fort Pierre to Bad Lands.
140. *Petalostemum violaceum*, Mich. Upper Missouri to Bad Lands.
141. *Petalostemum villosum*, Nutt. Bad Lands.
142. *Trifolium stoloniferum*, Muhl. Bad Lands.
143. *Trifolium pratense*, Linn. Lower Missouri.
144. *Trifolium repens*, Linn. Lower Missouri.
145. *Hosackia Purshiana*, Benth. Sandy bottoms of Missouri.
146. *Astragalus hypoglottis*, Linn. White river to Bad Lands.
147. *Astragalus gracilis*, Nutt. Bad Lands to the Yellowstone.
148. *Astragalus striatus*, Nutt. Fort Pierre to Bad Lands, covering prairies like clover fields.
149. *Astragalus Missouriensis*, Nutt. Fort Pierre to Fort Union.
150. *Astragalus caryocarpus*, Ker. Fort Pierre to Bad Lands.
151. *Astragalus Plattensis*, Nutt. Fort Pierre.
152. *Astragalus Canadensis*, Linn. Fort Pierre to Bad Lands.
153. *Astragalus racemosus*, Pursh. Abundant in the sandy bottoms of Missouri; Cedar island.

154. *Astragalus Drummondi*, Douglass. Sterile hills around Fort Union.
155. *Astragalus adsurgens*, Pall. James river.
156. *Phaca caespitosa*, Nutt. Bad lands.
157. *Phaca longifolia*, Nutt. Bad lands.
158. *Phaca pectinata*, Hook. Upland prairies on the Yellowstone river, abundant.
159. *Phaca elongata*, Hook. Fort Pierre to Fort Union.
160. *Orytropis Lamberti*, Pursh. Very abundant on praries around Big Sioux and Niobrara rivers.
161. *Oxytropis splendens*, Douglass. James river.
162. *Homalobus multiflorus*. Nutt. Big Sioux to bad lands.
163. *Kentrophyta montana*, Nutt. Abundant in sandy river bottoms on the Yellowstone.
164. *Hedysarum boreale*, Nutt. Abundant, mouth of Yellowstone.
165. *Desmodium Canadense*, D. C. Fort Clark.
166. *Desmodium Dillenii*, Darl. Big Sioux river.
167. *Desmodium paniculatum*, D. C. Bellevue, W. T.
168. *Desmodium nudiflorum*, D. C. Bellevue, W. T.
169. *Lespedera capitata*, Michx. Abundant on the rich bottoms about Council Bluffs, Big Sioux.
170. *Lespedeza hirta*, Ell. On Missouri.
171. *Crotalaria sagittalis*, Michx. Big Sioux river.
172. *Lupinus pusillus*, Pursh. Common on the Yellowstone.
173. *Lupinus perennius*, Linn. Platte valley.
174. *Thermopsis rhombifolia*, Nutt. From Council Bluffs to Fort Pierre; Bad Lands, &c.
175. *Sophora sericea*, Nutt. White River valley; Fort Pierre.
176. *Gleditschia tricanthos*, Linn. Occurs as high on the Missouri as Big Sioux.
177. *Cercis Canadensis*, Linn. Same as preceding.
178. *Cassia Chaemacrista*, Linn. Sandy bottoms of Missouri, from Council Bluffs to White river.
179. *Desmanthus brachylobus*, Benth. Council Bluffs and Platte valley; rich bottoms.
180. *Schrankia uncinata*, Willd. Gravelly hills on the upper Missouri generally.
181. *Gymnocladus Canadensis*, Lam. Abundant in woody bottoms to Big Sioux.
182. *Baptisia leucophea*, Nutt. Platte valley.
183. *Prunus Americana*, Marsh. Fort Pierre.
184. *Prunus pumila*, Linn. Abundant in the sand hills of Loup Fork; along Missouri river near Little Soldier's camp.
185. *Prunus serotina*, Ehrh. Council Bluffs.
186. *Prunus Virginiana*, Linn. Generally diffused.
187. *Gillenia stipulacea*, Nutt. Mouth of Big Sioux.
188. *Gillenia trifoliata*, Moench. Mouth of Big Sioux.
189. *Agrimonia eupatoria*, Linn. Bellevue, N. T.
190. *Agrimonia parviflora*, Ait. Around Fort Union.

191. *Chaemorhodas erecta*, var. *Nuttallii*, Torr. & Gray. Big Bend and Yellowstone.
192. *Geum strictum*, Ait. White river to Yellowstone.
193. *Geum album*, Gmel. Fort Pierre and Mandan village.
194. *Geum triflorum*, Pursh. Fort Union.
195. *Potentilla Norvegica*, Linn. Council Bluffs to Yellowstone.
196. *Potentilla paradoxa*, Nutt. Along banks of Missouri.
197. *Potentilla effusa*, Dougl.? Prairies near Fort Clark.
198. *Potentilla Pennsylvanica*, Linn, var. *strigosa;* Bad Lands.
199. *Potentilla diversifolia*, Lehm. Bad Lands.
200. *Potentilla rigida*, Nutt. Yellowstone.
201. *Potentilla Canadensis*, Linn. Big Sioux river.
202. *Potentilla anserina*, Linn. Niobrara run to Fort Pierre.
203. *Potentilla fructicosa*, Linn. On the Yellowstone.
204. *Potentilla arguta*, Pursh. Fort Clark and Fort Union.
205. *Fragaria vesca*, Linn. Along Missouri to Yellowstone.
206. *Fragaria Virginica*, Ehsh. Fort Union.
207. *Sanguisorba annua*, Nutt. Fort Union.
208. *Rubus occidentalis*, Linn. Council Bluffs.
209. *Rubus strigosus*, Mich. Sparingly on Yellowstone.
210. *Rubus villosus*, Ait. CouncilBluffs.
211. *Rosa blanda*, Ait. On prairies generally.
212. *Rosa lucida*, Ehrh. White river; Fort Pierre.
213. *Cratægus punctata*, Jacq. White river; Big Bend, &c.
214. *Crategus tomentosa*, var. *mollis*, Gray. Mouth of Big Sioux.
215. *Amelanchier Canadensis*, Torr. and Gray. Common throughout the upper Missouri country; bears a delicious fruit which ripens in June.
216. *Epilobium augustifolium*, Linn. Not uncommon in Kansas, also near Council Bluffs.
217. *Oenothera biennis*, Linn. Common along the valley of Missouri to the mountains.
218. *Oenothera albicaulis*, Nutt. White river valley and Yellowstone; rare.
219. *Oenothera cespitosa*, Nutt. Arid hills of upper Missouri.
220. *Oenothera serrulata*, Nutt. Council Bluffs to Fort Pierre.
221. *Oenothera pinnatifida*, Nutt. Bad Lands.
222. *Gaura biennis*, Linn. Along Missouri to Council Bluffs.
223. *Gaura coccinea*, Nutt. Common on high prairies and hills from Council Bluffs to the mountains.
224. *Ludwigia palustris*, Ell. Wet places in Platte valley, near Loup Fork.
225. *Circea lutetiana*, Linn. Fertile woody places along Missouri to Niobrara.
226. *Myriophyllum spicatum*, Linn. Common in ponds throughout upper Missouri.
227. *Hepparis vulgaris*, Linn. In standing pools, upper Missouri.
228. *Mentzelia ornata*, Torr. and Gray. Arid argillaceous hills from latitude 43° to the mountains.
229. *Mentzelia nuda*, Torr. and Gray. Same as preceding.

230. *Opuntia Missouriensis*, D. C. Common throughout the upper Missouri region.
231. *Opuntia fragilis*, Nutt. Peculiar to arid plains, upper Missouri.
232. *Opuntia.*
233. *Mammalaris vivipara.* Seen on the rich bottoms between Niobrara and Fort Pierre; bears beautiful purple blossoms.
234. *Mammalaris Nuttalli.* Common throughout the upper Missouri country above Fort Pierre; most abundant in White river valley.
235. *Ribes Missouriensis*, Nutt. Woody limestone banks around Council Bluffs.
236. *Ribes floridum*, Linn. Common on the upper Missouri and valley of Yellow stone.
237. *Ribes aureum*, Pursh. Banks and ravines along Missouri and Yellow stone.
238. *Echinocystis lobata*, Torr. and Gray. Durions' hills on Missouri.
239. *Penthorum sedoides*, Linn. In wet places, Platte valley; mouth of Loup Fork.
240. *Heuchera Americana*, Linn. Not rare in woody places along Missouri.
241. *Hamamelis Virginica*, Linn. Abundant in limestone woods along Missouri to mouth of the Platte river.
242. *Zizia aurea*, Koch. Prairies along Missouri to Big Sioux and Niobrara.
243. *Polytaenia Nuttallii*, D. C. Dry argillaceous hills and upland prairies around Fort Pierre; also on the Yellow stone.
244. *Sium lineare*, Michx. Moist places from mouth of Missouri to mountains.
245. *Thaspium barbinode*, Nutt. Rich woody places along Missouri.
246. *Thaspium aureum*, Nutt. Near Council Bluffs.
247. *Peucedanum fœniculaceum*, Nutt. Common on high prairies around Council Bluffs.
248. *Osmorrhiza longistylis*, *D. C.* Moist fertile woods to Fort Pierre.
249. *Osmorrhiza brevistylis*, *D. C.* With the preceding.
250. *Cicuta maculata*, Linn. Wet places, Platte valley.
251. *Aralia nudicaulis*, Linn. Limestone woods to Big Sioux river.
252. *Cornus florida*, Linn. Along the rich wooded bottoms as high as Fort Leavenworth.
253. *Cornus stolonifera*, Michx. Wooded bottoms of Missouri from mouth to source.
254. *Cornus sericea*, Linn. Abundant along Missouri bottoms. The inner bark is much used by the Sioux Indians with their tobacco in proportions of three to one; called by the traders "red osier."

255. *Symphoricarpus occidentalis*, R. Br. The most abundant shrub along the rivers and streams from the mouth of the Missouri to the mountains; often called "blue wood," much used for making brooms; sometimes covers the river bottoms almost exclusively.
256. *Lonicera ciliata*, Muhl. Woody ravines, near Council Bluffs, N. T.
257. *Triosteum perfoliatum*, Linn. Not rare as high up the Missouri as mouth of Big Sioux.
258. *Sambucus Canadensis*, Linn. Common along Missouri; seen in the valley of Yellowstone.
259. *Galium aparine*, Linn. Woody places along Missouri.
260. *Galium trifidum*, Linn. Moist low spots on Missouri.
261. *Galium boreale*, Linn. Same as preceding.
262. *Galium triflorum*, Michx. Same as preceding.
263. *Cephalanthus occidentalis*, Mich. Platte valley near Loup Fork.
264. *Oldenlandia angustifolia*, Gray. Along Missouri to Council Bluffs.
265. *Vernonia fasciculata*, Michx. Quite common on prairies, valley of Missouri.
266. *Kuhnia eupatorioides*, Linn. Council Bluffs to Niobrara.
267. *Eupatorium perfoliatum*, Linn. On rich bottom prairies near mouth of Big Sioux.
268. *Eupatorium purpureum*, Linn. Council Bluffs to James river.
269. *Eupatorium ageratoides*, Linn. Woody bottoms Council Bluffs to Fort Pierre.
270, *Liatris spicata*, Willd. Rich bottoms, Big Sioux.
271. *Aster cordifolius*, Linn. Not uncommon, Big Sioux and Niobrara.
272. *Aster saggitifolius*, Willd. Big Sioux and Niobrara.
273. *Aster azureus*, Lindl, Council Bluffs.
274. *Aster multiflorus*, Ait. Council Bluffs.
275. *Aster sericeus*, Vent. Fort Pierre.
276. *Aster Novae-Angliae*, Ait. Low places on Missouri.
277. *Aster laevis*, Linn. Upper Missouri.
278. *Erigeron pumilum*, Nutt. High hills around Fort Pierre.
279. *Erigeron strigosum*. Muhl. Low places, Vermilion Prairie.
280. *Erigeron Philadelphicum*, Linn. Alluvial bottoms of Missouri.
281. *Erigeron Canadense*, Linn. Common all over Missouri country.
282. *Aplopappus spinulosus*, *D. C.* High prairies of Upper Missouri.
283. *Solidago rigida*, Linn.
284. *Solidago incana*, Torr & Gray.
285. *Solidago nemoralis*, Ait.
286. *Solidago gigantea*, Ait.
287. *Solidago Missouriensis*, Nutt.
288. *Grindelia squarrosa*, Dunal. Common on high prairies from lat. 43° to the mountains; medicinal among Indians.
289. *Chrysopsis villosa*, Nutt. Common on dry hills, Fort Pierre.

290. *Silphium laciniatum*, Linn. Called by the inhabitants of the country, "Compass plant;" reaches its healthiest growth on the rich fertile bottoms of Missouri, but often found in great abundance on the high prairies. The highest point on the Missouri river that I have observed this plant is near lat. 44°, mouth White river; most abundant in the Platte valley and on the broad rich bottoms between Council Bluffs and Niobrara river, where it sometimes occupies large areas to the exclusion of other vegetation. That the leaves of this plant set their faces north and south, may be proved by a pocket compass. Forty-nine plants out of fifty exhibit this peculiarity. It thus becomes an excellent guide to the traveller across the pathless prairies.
291. *Silphium perfoliatum*, Linn. Seldom seen above Niobrara.
292. *Iva axillaris*, Pursh. Dry argillaceous hills. Fort Pierre and Fort Union.
293. *Ambrosia trifida*, Linn. Along streams and borders of woods from mouth of the Missouri to mountains. Quite abundant.
294. *Ambrosia coronopifolia*, Torr. and Gray. Fort Pierre.
295. *Xanthium strumarium*, Linn. Sandy bottoms of Yellow-stone.
296. *Echinacea purpurea*, Moench. Purple cone flower; called Rattlesnake weed in the west, and is found abundantly throughout the country. Root very pungent. Used very effectively by the traders and Indians for the cure of the bite of the rattlesnake.
297. *Lepachys columnaris*, Torr. and Gray. Common throughout the Missouri country, but most abundant from Council Bluffs to Niobrara river, on the rich broad-bottom prairies. In flower July 8th. Rays usually yellow, sometimes of a deep purple velvet.
298. *Lepachys pinnata*, Torr. and Gray. Vermilion prairie. Rare.
299. *Rudbeckia hirta*, Linn. Council Bluffs.
300. *Heliopsis leavis*, Pers. Along streams in Kansas and southern Nebraska.
301. *Helianthus giganteus*, Linn. Common on Upper Missouri.
302. *Helianthus gross-serratus*, Martens. Common on prairies.
303. *Coreopsis tripteris*, Linn. Council Bluffs.
304. *Coreopsis tinctoria*, Nutt. James river, Big Sioux, &c.
305. *Actinomeris squarrosa*, Nutt. Common in thickets, and along streams in Kansas and Nebraska.
306. *Bidens connata*, Muhl. Missouri, and White river Valley.
307. *Bidens Beckii*, Torr. Council Bluffs.
308. *Dysodia chrysanthemoides*, Lag. Very abundant in prairie-dog villages on the upper Missouri.
309. *Helenium autumnale*, Linn. Kansas and southern Nebraska.
310. *Anthemis arvensis*, Linn. Naturalized to Fort Leavenworth.
311. *Achillea millefolium*, Linn. Found all over the prairie country of the west; must be indigenous west of the Mississippi.
312. *Antennaria plantaginea*, R. Br. Upper Missouri and Black Hills.

313. *Antennaria dioica*, R. Br. Same as last.
314. *Artemisia filifolia*, Torr. Gravelly hills along Platte; "Bad Lands."
315. *Artemisia cana*, Pursh. In the valley of Missouri and Platte.
316. *Artemisia frigida*, Willd. From latitude 43° to mountains.
317. *Artemisia dracunculoides*, Fort Pierre to Bad Lands.
318. *Artemisia tridentata*, Nutt. Common in Bad Lands.
319. *Artemisia biennis*, Willd. In Platte Valley.
320. *Artemisia Canadensis*, Michx. Near Fort Laramie.
321. *Artemisia ludoviciana*, Nutt. Shyenne river.
322. *Gnaphalium uliginosum*, Linn. Council Bluffs.
323. *Senecio aureus*, Linn, Council Bluffs and Big Sioux.
324. *Senecio integerrimus*, Nutt. About Council Bluffs to mountains.
325. *Linosyris graveolens*, Torr. and Gray. A very common shrub from latitude 44° to mountains; sometimes associated with *Sarcobatus vermicularis*, and sometimes taking its place.
326. *Cacalia tuberosa*, Nutt. Not uncommon on the rich bottoms of the Missouri and Platte.
327. *Lygodesmia juncea*, Don. A very abundant plant all over the sterile hills of the Upper Missouri and its tributaries; grows most luxuriantly on the second upland prairie. It makes its first appearance near Council Bluffs, and extends to the mountains.
328. *Cirsium altissimum*, Spreng. Platte valley.
329. *Brickelia oblongifolia*. Along Missouri river.
330. *Franseria ambrosioides*, Cab. Sandy bottoms of the Yellowstone.
331. *Sonchus asper*, Vill. Council Bluffs.
332. *Mulgedium pulchellum*, Nutt. Big Sioux river.
333. *Troximon cuspidatum*, Pursh. Council Bluffs and Big Sioux.
334. *Lobelia cardinalis*, Linn. Moist places along the Missouri to the Big Sioux; in Kansas, on Big Cottonwood creek.
335. *Lobelia spicata*, Lam. Mouth of the Platte.
336. *Lobelia inflata*, Linn. Yellow-stone valley, where it is cultivated by the Crow Indians, and used in their religious ceremonies.
337. *Campanula rotundifolia*, Linn. Common to Fort Clark.
338. *Specularia perfoliata*, D. C. Throughout the Upper Missouri country.
339. *Arctostaphylos uva-ursa*, Spreng. Very abundant on the high rocky hills about Fort Clark; also abundant in the mountains. It is the real "Kininkkinnick" of the Indians, and used by them to mix with their tobacco, in preference to any other plant. The bark of *Cornus sericea* is used as a substitute only in the absence of the *A. uva-ursi*.
340. *Chimaphila umbellata*, Nutt. Black Hills.
341. *Diospyros Virginiana*, Linn. Is found in Kansas.
342. *Plantago major*, Linn. On river bottom near Fort Clark.

343. *Plantago patagonica*, Var., *gnaphaloides*. Very abundant in sand soil and gravelly places on the Upper Missouri.
344. *Plantago pusilla*, Nutt. On prairies near Fort Pierre; also on the river opposite St. Joseph, in Kansas.
345. *Lysamachia stricta*, Ait. Platte valley, upon Missouri.
346. *Utricularia inflata*, Walt. In ponds, Council Bluffs, White river valley.
347. *Phelipœa ludoviciana*, Don. Sandy prairies, Yellowstone.
348. *Aphyllon fasciculatum*, Torr. & Gray. Great Bend of Missouri.
349. *Aphyllon uniflorum*, Torr. & Gray. Council Bluffs.
350. *Scrophularia nodosa*, Linn. Abundant along thickets and streams, Kankas and Nebraska.
351. *Chelone glabra*, Linn. Along valley of Missouri to latitude 43°.
352. *Penstemon grandiflorus*, Fraser. A beautiful plant found along the bluffs of the Platte, banks and sandy bottoms of Missouri to mountains.
353. *Penstemon cœruleum*, Nutt. Eagle Nest hill, White river valley.
354. *Penstemon erianthum*, Nutt. Hills around Fort Pierre.
355. *Penstemon albidum*, Nutt. Low with glabrous calyx. Hills around Fort Pierre.
356. *Penstemon cristatum*, Nutt. On high prairies; Upper Missouri.
357. *Penstemon gracile*, Nutt. Prairie bottoms, near Fort Pierre.
358. *Penstemon pubescens*, Solander. Fort Pierre; June.
359. *Penstemon levigata*, Solander. Fort Leavenworth; May.
360. *Mimulus virgeus*. Linn. Council Bluffs and Big Sioux.
361. *Mimulus Jamesii*, Torr. On the Platte. Dr. Cooper.
362. *Gratiola Virginica*, Linn. Quite common along the Missouri.
363. *Veronica anagallis*, Linn. Common; Council Bluffs.
364. *Veronica scutellata*, Linn. With the preceding.
365. *Veronica peregrina*, Linn. Fort Pierre.
366. *Geradia purpurea*, Linn. Council Bluffs.
367. *Castilleia sessiliflora*, Pursh. Common about Council Bluffs.
368. *Castilleia septentrionalis*, Lindl. Black Hills.
369. *Melampyrum americanum*, Michx. Extends up the Missouri as far as the mouth of the Platte.
370. *Dianthera americana*, Linn. Platte valley.
371. *Verbena bracteosa*, Michx. A very common plant about prairie dog villages on the upper Missouri.
372. *Verbena hastata*, Linn. Platte valley.
373. *Verbena stricta*, Vent. Platte valley; July.
374. *Verbena aubletia*, Linn. Along the Missouri in Kansas.
375. *Lippia lanceolata*, Michx. Fort Leavenworth, Kansas Territory.
376. *Phryma leptostachya*, Linn. Not rare along the Missouri to latitude 43°.
377. *Mentha Canadensis*, Linn. Common in wet places, valley of the Missouri and Platte.
378. *Lycopus sinuatus*, Ell. Same as preceding.
379. *Monarda fistulosa*, Linn. Common along streams to mountains.
380. *Hedeoma hirta*, Nutt. Abundant in the prairie dog villages, upper Missouri.

381. *Blephilia ciliata*, Raf. Fort Pierre to Bad Lands.
382. *Lophanthus anisatus*, Benth. James river; on Missouri.
383. *Scutellaria parvula*, Michx. Council Bluffs.
384. *Tencrium Canadense*, Linn. Council Bluffs.
385. *Lithospermum canescens*, Lehm. High prairies, Council Bluffs.
386. *Lithospermum latifolium*, Michx. Fort Pierre.
387. *Myosotis glomerata*, Nutt. On dry sterile hills, Fort Pierre, and Bad Lands.
388. *Onosmodium hispidum*, Michx. Prairies about Leton river; Fort Pierre.
389. *Mertensia Virginica*, D. C. Fort Pierre; in bloom April 20, 1855.
390. *Echinospermum patulum*, Lehm. Prairies about Fort Pierre.
391. *Echinospermum lappulum*, Lehm. Prairies about Fort Pierre.
392. *Hydrophyllum Virginicum*, Linn. Shady woods as high up the Missouri as mouth of White river, and in White river valley. Most abundant in the carboniferous limestone regions of Council Bluffs; April.
393. *Hydrophyllum macrophyllum*, Nutt. With preceding.
394. *Ellisia nyctelea*, Linn. About old houses and gardens to Big Sioux, and along old roads in prairie dog villages on the upper Missouri.
395. *Phacelia circinata*, Jacq. In Kansas; Dr. Cooper.
396. *Phlox divaricata*, Linn. Council Bluffs and Platte valley.
397. *Collomia linearis*, Nutt. Common about Fort Pierre; Fort Union.
398. *Gilia longiflora*, Torr. In sand hills of Niobrara river.
399. *Ipomea lepttophylla*, Torr. I have seen this plant in but one locality along the Missouri; Bear creek near "Bad Lands." But in the sand hills on Loup Fork, along the Niobrara, and around Fort Laramie, it is very abundant.
400. *Cuscuta glomerata*, Choisy. Abundant on sandy bottoms of Missouri.
401. *Solanum nigrum*, Michx. Not rare on the sandy bottoms of Missouri.
402. *Solanum triflorum*, Nutt. Very abundant in prairie dog villages on Upper Missouri.
403. *Solanum Carolinense*, Linn. Along Missouri to Council Bluffs.
404. *Physalis lanceolata*, Michx. Sandy bottoms of Missouri to Fort Pierre.
405. *Physalis viscosa*, Linn. Sandy bottoms of Missouri to mountains.
406. *Androcera lobata*, Nutt. Very abundant about old trading houses, along old roads, and in prairie dog villages on Upper Missouri.
407. *Apocynum cannabinum*, Linn. Abundant on low bottoms of Missouri to mountains.
408. *Asclepias macranthera*, Torr. Not rare on the moist prairies of upper Missouri, Loup Fork, Platte valley; July 16.
409. *Asclepias incarnata*, Linn. Moist places Loup Fork, Platte.

410. *Asclepias tuberosa*, Linn. Mouth Big Sioux, and in Platte valley.
411. *Asclepias verticellata*, Linn. Abundant on prairies; Fort Pierre.
412. *Anantherix viridis*, Nutt. Platte valley; Loup Fork; July 16.
413. *Acerates longifolia*, Nutt. Common around Fort Pierre.
414. *Acerates angustifolia*, Nutt. With preceding.
415. *Fraxinus Americana*, Linn. Generally diffused.
416. *Asarum Canadense*, Linn. Near Council Bluffs.
417. *Oxybaphus angustifolius*, Torr. Dry hills around Fort Pierre.
418. *Chenopodium album*, Linn. Platte valley; Fort Pierre.
419. *Obione canescens*, Moq. "Bad Lands;" common.
420. *Salicornia herbacea*, Linn. Saline places; Fort Union.
421. *Sarcobatus vermicularis*, Nees. This is one of the most abundant shrubs on the Upper Missouri. It makes its first appearance near latitude 44°, and seems to thrive best in the saline clays of the cretaceous and tertiary formations. It is sometimes called "Grease wood" by the traders, and is often used for fuel by them on the Yellowstone river, where it grows to the height of ten or twelve feet, with trunks two to three inches in diameter. On the Yellowstone and along the Missouri it sometimes covers many square miles to the exclusion of other plants.
422. *Amaranthus albus*, Linn. Sandy bottoms and shores of Missouri.
423. *Rumex persicarioides*, Linn. Sandy bottoms of Missouri.
424. *Rumex venosus*, Pursh. Old Ponca village; Loup Fork.
425. *Polygonum amphibium*, Linn. Low wet places along Missouri.
426. *Polygonum aviculare*, Linn. Council Bluffs along Missouri.
427. *Polygonum tenue*, Michx. Council Bluffs to mountains.
428. *Benzoin odoriferum*, Nees. Woody bottoms along Missouri, below Niobrara.
429. *Shepherdia argentea*, Nutt. Very abundant from mouth of Big Sioux river to the mountains. It bears a profusion of red acid fruit, called buffalo berries.
430. *Eleagnus argentea*, Pursh. I have seen this shrub in but one locality in Missouri, near Fort Clark, on the high tertiary hills.
431. *Comandra umbellata*, Nutt. Fort Pierre and on the Yellowstone.
432. *Euphorbia corallata*, Linn. Quite common on Missouri to latitude 45°.
433. *Euphorbia marginata*, Pursh. Very abundant to mountains.
434. *Euphorbia maculata*, Linn. Same as last.
435. *Euphorbia polygonifolia*, Linn. Along old roads, Upper Missouri.
436. *Ulmus fulva*, Michx. Abundant on the rich bottoms of Missouri to Big Sioux, and ceases to appear at the mouth of Niobrara river.
437. *Ulmus Americanus*, Linn. Along rivers and streams to mountains.
438. *Celtis occidentalis*, Linn. Abundant near to Niobrara river.

439. *Morus rubra*, Linn. Very abundant to mouth of Big Sioux; seen sparingly and of small growth to the mountains.
440. *Urtica gracilis*, Ait. Thickets and streams to Niobrara.
441. *Urtica Canadensis*, Linn. Same as preceding.
442. *Parietaria Pennsylvanica*, Muhl. Missouri and Yellowstone.
443. *Humulus lupulus*, Linn. Most abundant in the Upper Missouri country.
444. *Platanus occidentalis*, Linn. Abundant on the rich bottoms of Missouri and Kansas; but ceases to appear about one hundred miles above Council Bluffs.
445. *Juglans cinerea*, Linn. Bix Sioux.
446. *Juglans nigra*, Linn. Does not extend above latitude 43°.
447. *Quercus tinctoria*, Bartram. Council Bluffs and Big Sioux.
448. *Quercus rubra* Linn. With preceding.
449. *Quercus macrocarpa*, Michx. Extends to mountains.
450. *Corylus Americana*, Walt. Abundant around Council Bluffs.
451. *Betula*. Black hills.
452. *Alnus*. Black hills.
453. *Populus tremuloides*, Michx. Black hills.
454. *Populus angustifolia*, Torr.
455. *Populus monilifera*, Ait. A large tree, constituting by far the greater portion of the timber along the valley of Missouri.
456. *Salix*. Several species.
457. *Pinus ponderosa*, Douglass. Black hills.
458. *Abies Douglassi*. Bad lands of the Judith.
459. *Juniperus Virginiana*, Linn. Along Missouri to mountains.
460. *Arum triphyllum*, Torr. Low ponds to Big Sioux.
461. *Arum Dracontium*, Schott. Found by Dr. Cooper in Kansas.
462. *Typha latifolia*, Linn. Mouth of Platte.
463. *Sparganium ramosum*, Hudson. Low places to Fort Pierre.
464. *Lemna*. Common in ponds on upper Missouri.
465. *Potamogeton natans*, Linn. White river valley.
466. *Potamogeton pectinatus*, Linn. In ponds. Bad Lands.
467. *Alisma plantago*, Linn. Common in ponds, upper Missouri.
468. *Sagittaria variabilis*, Engelmann. With preceding.
469. *Platanthera leucophea*, Nutt. Lower Platte.
470. *Spiranthes cernua*, Rich. Rich bottom prairies of Vermilion.
471. *Cypripedium pubescens*, Willd. Rocky banks to Big Sioux river.
472. *Cypripedium acaule*, Ait. With the preceding.
473. *Iris versicolor*, Linn. Lower Platte.
474. *Sisyrinchium anceps*, Linn. Bottom prairies to Fort Pierre.
475. *Hypoxis erecta*, Linn. Council Bluffs.
476. *Trillium sessile*, Willd. Extends to Big Sioux.
477. *Smilax herbacea*, Linn. Common. Mouth of Platte.
478. *Smilax rotundifolia*, Linn. Along Missouri to mouth of Platte.
479. *Smilacina stellata*, Desf. Very abundant to Niobrara, and occasionally seen to the mountains.
480. *Smilacina racemosa*, Desf. Council Bluffs.
481. *Polygonatum giganteum*, Dietrich. Council Bluffs.

482. *Allium Canadense*, Linn. Big Sioux.
483. *Allium reticulatum*, Nutt. Abundant about Fort Pierre.
484. *Allium stellatum*, Nutt. Platte and Loup Fork.
485. *Lillium canadense*, Linn. Big Sioux to Fort Pierre.
486. *Erythronium americanum*, Smith. Council Bluffs.
487. *Erythronium albidum*, Nutt. Council Bluffs.
488. *Yucca angustifolia*, Sims. From the mouth of Niobrara river to mountains; on sterile hills.
489. *Streptopus amplexifolius*, D. C. Council Bluffs.
490. *Melanthium Virginicum*, Linn. Big Sioux.
491. *Juncus tenuis*, Willd. Abundant on bottoms of Missouri.
491. *Juncus polycephalus*, Michx. Bad Lands, &c.
493. *Tradescantia Virginica*, Linn. Sandy bottoms of Missouri and its tributaries; generally diffused.
494. *Scirpus*. Many species.

The Carices of the botanical collection were submitted to the distinguished botanist, Professor Chester Dewey, of the University of Rochester, New York, who is unquestionably the best living Caricographer in our country. Even now, at the advanced age of seventy-four years, his enthusiasm in his favorite departments of Natural History continues unabated; and that his useful life may still be spared to us many years to come is the earnest desire of more than one young student of science who have been encouraged by his kind words and unselfish aid to seek a recognition in the scientific world. After a careful examination, the following catalogue and notes were received from Professor Dewey:

MY DEAR SIR: I enclose the list of all the Carices from Nebraska Territory that you placed in my hands for examination. The whole is a very interesting collection. I only wonder that, with your other objects of special attention, you were able to seize upon so many of these sedges; and yet I know they are only a small portion of the plants you have thus preserved. Wishing you all prosperity, and rejoicing in your perseverance and success,

I am truly yours,

C. DEWEY.

Dr. F. V. HAYDEN.

LIST OF NEBRASKA CARICES.

495. *Carex straminea*, Willd. Above Fort Pierre.
var. *Minor*, Dew. Fort Pierre.
496. *Carex cristata*, Schm. Little Sioux river.
497. *Carex stipata*, Muhl. Little Sioux river.
498. *Carex vulpinoidea*, Muhl. Common.
499. *Carex mirabilis*, Dew. Common.
500. *Carex cephaloidea*, Muhl. Near Fort Leavenworth.
501. *Carex scirpoides*, Schk. Near Fort Leavenworth.
502. *Carex festucacea*, Schk. Missouri, below Fort Pierre.
503. *Carex Muhlenburghii*, Schk. Missouri, below Fort Pierre.

*504. *Carex vulpina*, Linn. Large and fine. Missouri, below Fort Pierre.
505. *Carex tenera*, Dew. Missouri, below Fort Pierre.
506. *Carex hookeriana*, Dew. Missouri, below Fort Pierre.
507. *Carex rosea*, Schk. Southern Nebraska.
var. *radiata*, Dew. Southern Nebraska.
508. *Carex setacea*, Dew. Southern Nebraska.
509. *Carex teretiuscula*, Good. Southern Nebraska.
510. *Carex scoparia*, Schk. Common.
†511. *Carex petasata*, Dew. Upper Missouri.
‡512. *Carex stenophylla*, Wahl. Upper Missouri.
513. *Carex festiva*,? Dew. (Too old to decide.) Near Fort Leavenworth.
§514. *Carex Douglasii*, Boott. Before credited to arctic regions.
515. *Carex leporina*, Linn. Before credited to arctic regions.
516. *Carex obtusata*, Lily. Upper Missouri.
517. *Carex blanda*, Dew. Near Fort Clark.
518. *Carex anceps*, Schk. Near Fort Clark.
519. *Carex hystericina*, Wild. Eagle-nest creek.
520. *Carex grisea*, Wahl. Near Fort Leavenworth.
521. *Carex marginata*, Muhl. Missouri, near Fort Pierre.
522. *Carex arctata*, Boott. Missouri, near Fort Pierre.
523. *Carex crauei*, Dew. Missouri river.
524. *Carex steudelli*, Kth. Missouri river.
525. *Carex moodii*, Dew. Missouri river.
526. *Carex eburnea*, Boot. Missouri river.
527. *Carex lanuginosa*, Michx. Yellowstone, &c.
528. *Carex aristata*. K. Br. "Bad Lands."
var. *longo-lanceolata*, Dew. "Bad Lands."
529. *Carex riparia*, Good. Along Missouri.
530. *Carex trichocarpa*, Muhl. Along Missouri.
531. *Carex vesicaria*, Linn. Along Missouri.
532. *Carex longirostris*, Torr. Along Missouri.
533. *Carex filiformis*, Good. Eagle-nest creek.
534. *Carex acuta*, Linn. Eagle-nest creek.
535. *Carex vulgaris*, Fries. Eagle-nest creek.
536. *Carex stricta*, Lam. Eagle-nest creek.
537. *Carex strictior*, Dew. Eagle-nest creek.
538. *Carex recta*, Boott. Near Fort Pierre.
539. *Carex davisii*, Torr. Yellowstone river.
540. *Carex shortiana*, Dew. Along Missouri.

NOTES BY PROF. DEWEY.

* *C. vulpina*, Linn. First found in our country in Ohio, several years since, and cannot be confounded with *C. stipata*, Muhl. It seems to abound in Nebraska, large and fine.

† *C. petasata*, Dew. Collected first in Arctic America, and is abundant in Nebraska.

‡ *C. stenophylla*, Wahl. A northern carex in Europe, and first published by Dr. Boott among the "Carices of British North America" as common there, and is abundant in Nebraska.

§ *C. Douglasii*, Boott. First described in Dr. Boott's work just mentioned, but now found in Nebraska, which seems to have strayed, like *C. Richardsoni*, in our latitude.

541. *Carex ampullacea*, Good. Along Missouri.
542. *Carex monile*, Tuckerman. Along Missouri.
543. *Carex curta*, Good. Yellowstone river.
544. *Carex lacustris*, Willd.

The following species seem to be new:

545. *Carex Nebrascensis*, Dew. Missouri river, near Fort Pierre.
546. *Carex Haydeni*, Dew. Missouri river, near Fort Pierre.
547. *Carex Meekii*, Dew. Yellowstone river.
548. *Carex leavi-conica*, Dew. Yellowstone river.
549. *Zizania aquatica*, Linn. Along Missouri, wet ponds near Council Bluffs.
550. *Alopecurus geniculatus*, Linn. Near low wet spots on Missouri near Big Sioux and mouth of Loup Fork.
551. *Vilfa cuspidata*, Torr. Along Missouri river; also on high hills along White river.
552. *Sporobalus heterolepis*, Gray. Along Shyenne river in Missouri.
553. *Agrostis michauxiana*, Torr. Bottoms of Kansas, also on James and Shyenne rivers, upper Missouri.
554. *Agrostis cryptandra*, Torr. Banks of Little Sioux river.
555. *Muhlenbergia glomerata*, Linn. Abundant on prairies of upper Missouri; wood lands, &c.
556. *Calamagrostis Canadensis*, Beauv. Lower Missouri.
557. *Calamagrostis longifolia*, Henk. Sandy bottoms.
558. *Calamagrostis stricta*, Nutt. Along Missouri, moist places.
559. *Stipa spartea*, Linn. Prairies of upper Missouri.
560. *Stipa capillata*, Linn.
561. *Stipa membranacea*, Pursh. Sandy banks of Shyenne river.
562. *Aristida pallens*, Nutt. Sterile hills along Missouri; also on the Platte.
563. *Spartina cynosuroides*, Willd. Low situations on Missouri.
564. *Bouteloua oligostachya*, Torr. Upland prairies of Missouri.
565. *Sesleria dactyloides*, Nutt. This is one of the most abundant as well as useful grasses on the Upper Missouri. It grows in low matted tufts, covering the prairies oftentimes for many miles, and furnishing a most nutritious and palatable food for the buffalo, deer and other game; also for the horses of the Indian and voyageur.
566. *Festuca tenella*, Willd. Valley of the Missouri.
567. *Festuca nutans*, Willd. Along bottoms of Kansas.
568. *Kaleria cristata*, Linn.
569. *Eatonica Pennsylvanica*
570. *Poa pratensis*, Linn.
571. *Poa annua*, Linn. Sandy bottoms along Missouri.
572. *Poa nervata*, Willd. On the Kansas.
573. *Poa nemoralis*, Linn. Shady woods and ravines on Missouri.
574. *Arundo phragmites*. Abundant in moist places around Council Bluffs.
575. *Elymus Canadensis*, Linn. Wooded banks to mountains.

576. *Bruchmannia cruciformis*, Jacq. A beautiful grass, growing in low moist places. I have not seen it above Fort Pierre.
577. *Uniola stricta*, Torr. Hills of the Upper Missouri.
578. *Uniola paniculata*, Linn. Near Fort Leavenworth, K. T.
579. *Triticum repens*, Linn. Abundant along Missouri river.
580. *Hordeum pratense*. Above Missouri river.
581. *Hordeum pusillum*, Nutt. Above Missouri river.
582. *Hordeum jubatum*, Ait. Above Missouri river.
583. *Aira latifolia*. Above Missouri river.
584. *Aira elongata*. Above Missouri river.
585. *Ceratochloa grandiflora*.
586. *Cenchrus tribuloides*, Linn. Very common in Kansas, and seen on sand bottoms in the valley of Yellowstone.
587. *Andropogon scoparius*, Michx. Sandy bottoms of Missouri.
588. *Eragrostis poaoides*, Beauv. Along sandy bottoms, Lower Missouri.
589. *Monroa squarrosa*, Torr. in Whipple's Report. Great Bend of the Upper Missouri.
590. *Equisetum arvense*, Linn. Sandy bottoms along Missouri.
591. *Equisetum hyemale*, Linn. Covers large areas on sandy bot toms of Missouri and tributaries.
592. *Adiantum pedatum*, Linn. Council Bluffs.
593. *Botrychium Virginicum*, Swartz. Mouth of the Platte.

XIV.

Annual Report of operations upon the extension of the United States Capitol, the new dome, and the continuation of the post office building during the year ending September 30, 1858.

OFFICE OF THE EXTENSION OF THE CAPITOL,
Washington, November 15, 1858.

SIR: I have the honor to report the progress during the past year of the works of the extension of the Capitol.

A few days after the date of my last annual report I had the honor to inform you that the new hall of representatives was completed and ready for use. Some delay in occupying it was caused, I believe, by the apprehension of members that the walls were not dry enough for health; but a special committee having been instructed to examine the hall, made the following report on the 14th December:

"The special committee to examine into and report on the condition of the new hall of representatives in the south wing of the Capitol, and when it will be safe to occupy it, respectfully report:

"That they visited and inspected the hall on the morning of the 12th instant. Some of the members of the committee had supposed that, the room having been lately finished, the walls must necessarily be damp. But on consulting with the superintendent, Captain M. C. Meigs, of the Corps of Engineers, they were informed that the walls of the chamber had been built for two or three years, and the interior walls supporting the galleries, and the walls under the floor for several months; that they were all laid in brick and cement, which dries much more rapidly than common lime mortar. There was no appearance of dampness about the room or walls, excepting where the first plastering, having been injured in putting up the door-frames, had been removed and replaced, to a small extent, by fresh plaster, which of itself had been upon the walls for some two weeks.

"A hygrometer above the Speaker's desk indicated a dry atmosphere; and, so far as the committee could judge from their own sensations, the air in the room was as dry as that of any ordinary apartment. They found the room warm, well lighted, and ventilated by a supply of air, which they are assured by Captain Meigs, the superintendent, was flowing through the room at the rate of not less than eleven thousand five hundred feet per minute, as determined by observations at the inlet passages by a delicate anemometer. The temperature had been designedly raised rather higher than was agreeable, in order, by driving through the room a large quantity of air at a high temperature, to raise that of the large body of masonry in the flues under the floor, which had been chilled by the cold weather immediately preceding the meeting of Congress and the completion of the heating apparatus.

"The two fans—one of which is intended to drive air through the large coil of steam pipes provided for heating the House of Representatives, and the other through the numerous coils arranged in different

parts of the cellars to supply heat to the committee rooms, lobbies, and corridors of the building—are not yet completed. But as the air, warmed by the steam coils, rises into the rooms in sufficient quantity, in consequence of the difference in specific gravity of heated and cold air, the heating and ventilation of these rooms were found to be in a very satisfactory state, the only fault to be found with them being that they were, perhaps, too warm. This heat, however, is under perfect control, and can be increased or diminished at pleasure.

"The supply of air to the representatives' chamber, at the time of the committee's visit, has already been stated at eleven thousand five hundred feet per minute, by actual measurement. They were informed that the fan which is being built for the supply of the hall, will be capable of supplying one hundred thousand cubic feet per minute—a quantity sufficient to change entirely the air contained in the hall every five minutes ; the cubic contents of the hall and galleries being four hundred and sixty-five thousand cubic feet.

"The members' retiring room, the Speaker's room, the Clerk's rooms, the room for the Sergeant-at-Arms, the current document rooms, the cloak and hat and wash rooms are conveniently arranged near the hall, and are ready to be furnished and occupied.

"The south lobby and the private stairs are so arranged as to admit of cutting off all the above rooms from the admission of strangers, and reserving them for the sole use of the House; and this the committee recommend to be done by order of the House.

"For the official reporters of the House a convenient desk, immediately under the Clerk's desk, is provided, and for the accommodation of the reporters of the public press there is ample room in the gallery immediately over the Speaker's chair and east of the railing. The committee recommend that this part of the gallery and the room immediately behind it in the third story be set apart for their use, and provided with desks and conveniences for taking and writing out their notes. The telegraphic wires should also be introduced into this room, so as to permit the transmission of intelligence direct from the reporters to the distant press. By this means the report of an hour's speech might be completely set up in New York within fifteen minutes after its delivery.

"The corridors leading to the hall are dry and comfortable. In some of them the tile floors are not yet laid, but there is no reason for waiting until this is done. The floors are of brick and can remain in their present condition until the termination of the session, the tiles in the meantime being stored in the cellar.

"For the present the committees and the officers of Congress whom it may not be convenient to accommodate can remain in the old building, to which there will be convenient access through a covered passage leading from the new directly to the old hall, which it will enter by the window-door behind the Speaker's chair.

"The committee made some trial of the acoustic qualities of the room. They found very little reverberation—so little as not to interfere with distinctness of hearing; and ascertained by trial that not only could all that was said at the Speaker's desk be heard on all

parts of the floor and galleries, but that the voice from each member's desk or from any part of the galleries could be easily made audible in all parts of the room, without raising it above the tone required in speaking across a table.

"There may be some little inconvenience and interruption of work upon unfinished parts of the building outside of the hall, but the hall itself is completely ready for the use of the House; and, in view of the great advantages in the comfort, convenience, and health of the members; the great improvement in the transaction of the legislative business, from the perfect acoustic qualities of the room insuring to every member, wherever his seat may be, the ability to be heard and understood when he may address the House; and in view of the fact that the immense expenditure of the Capitol extension has been incurred solely for the purpose of providing such rooms for the deliberations of Congress, they cannot hesitate to recommend that the House avail themselves of the use of this room as soon as possible.

"Some furniture and books for current use it will be necessary to remove, and some lumber and rubbish yet encumber the approaches. These can all, in their opinion, be removed by Wednesday morning, and they therefore recommend the adoption of the following resolution:

"*Resolved*, That when this House adjourns to-morrow it will adjourn to meet in the new hall of representatives, in the south wing of the extension of the Capitol, on Wednesday at noon."

The resolution of the committee was adopted, and on the 16th of December the House of Representatives for the first time assembled in the new hall.

The first public use of the hall was on Sunday, the 13th of December, on which day divine service was held in it, the Rev. G. D. Cummins officiating.

When the charge of the Capitol extension was committed to me in April, 1853, my attention was particularly directed by your predecessor, the Hon. Jefferson Davis, Secretary of War, to the great importance of providing rooms suited by their acoustic qualities, by their warming, ventilation, and lighting for the purposes of legislation. In his instructions to me on taking charge of the work I was told: "The great object of the extension of the Capitol is to provide rooms suitable for the meeting of the two houses of Congress—rooms in which no vitiated air shall injure the health of the legislators, and in which the voice from each member's desk shall be easily made audible in all parts of the room. These problems are of difficult solution, and will require your careful study."

I was fully impressed with the difficulty and importance of the question; for the whole vast expenditure of the extension of the Capitol may be said to have been incurred almost solely because the representative chamber in the old building was so unfortunate in its acoustic qualities. The great difficulty of speaking and hearing in it seriously affected the course of legislation. The influence of a member in debate depended too much upon the possession of strength of voice to make itself heard through the irregular echoes and rever-

berations of the hall, and many men, finding the effort to speak exhausting and injurious, were forced to abandon the attempt to exercise that influence upon the legislation of the country to which their talents and their acquirements entitled them.

The defects of the room led to disorder and irregularity, and it was to be hoped that if a room could be constructed in which an ordinary voice could be distinctly heard by every member on the floor, it would lead to greater attention to the debates and a better understanding of the important subjects constantly coming before the House.

In attempting the study of this subject I found little settled or satisfactory, and the state of the science may be summed up in the evidence of Faraday before a British parliamentary commission, when examined in regard to the plans of the new houses of parliament then under consideration.

He stated that he did not think it would be possible to prepare plans beforehand which should certainly accomplish the object of securing a good room for speaking and hearing; that an architect might fail because he was not a scientific man, and a scientific man because he was not an architect; that his own lecture room at the Royal Institution was a good room, but he did not know the reason why.

The results of my studies were a recommendation to abandon the plans of the legislative halls and the whole interior arrangement of the new wings of the Capitol as then under construction, and the adoption of plans which I had the honor of presenting. That of the new hall of representatives, as since constructed in the south wing, was presented to the Hon. Secretary Davis on the 19th of May, 1853, with a report upon the reasons for adopting it and the principles upon which it was based, which was printed in the annual report from this office of October 22, 1853.—(See Ex. Doc. No. 1, 33d Congress, 1st session, part II, pages 79 to 84.)

The propriety of the course adopted and the success of the plans have been proved by the use of the hall during the last winter, as is shown by the following letter, which I had the honor to receive from the Speaker of the House of Representatives, the Hon. James L. Orr:

"ANDERSON, SOUTH CAROLINA, *August* 13, 1858.

"SIR: At an early period during the last session of Congress you requested me to give my opinion of the fitness of the new hall of the House of Representatives for the purposes of its erection. I delayed responding to your request until the close of the session, that I might form an opinion upon such observation, at all seasons and under all circumstances, as would be definite and satisfactory.

"It has been occupied from December until the middle of June—seasons of the lowest and highest temperature of cold and heat; it has been occupied with crowded galleries and empty benches, by day and by night; and under all circumstances, in its acoustics, its ventilation, its heating, its lighting, and its conveniences for the comfort of members and the transaction of business, I consider it eminently

successful. When order is preserved an ordinary voice can be heard distinctly in the remotest part of the hall or galleries. I presume there is no hall in the world, having so large a number of square feet within its walls, where the speaker is heard with so little effort on his part.

"The ventilation is equally successful. The densest crowd in the galleries, during the most protracted sittings, breathed a fresh atmosphere, free from all heaviness or impurity.

"The heating apparatus is so perfect that the engineer had only to be notified what temperature was desired, when in a few minutes it was supplied.

"The arrangement for lighting the hall is admirable. Not a burner is seen, and yet such a flood of softened light is poured down through the stained glass ceiling of the hall that it was difficult to distinguish when the day ended and the night commenced.

"The hall and its fixtures are a splendid triumph of your professional skill, and will ever remain a proud monument to your genius.

"I am, sir, very respectfully, yours, &c.,

"JAMES L. ORR, *Speaker.*

"Captain M. C. MEIGS,
"*Engineer, &c., Washington.*"

It is with no ordinary satisfaction that I am able thus to place upon record the proof of the complete success of the work committed to me, and upon which I have been so long engaged.

I believe that in the influence to be exerted upon the legislation of the country, by the great advantages this hall affords in the more intelligent transaction of the public business; in the greater facilities for seeing and hearing, and thus of understanding what is before the House, its cost, which may be considered as the cost of the extension itself, will be early repaid to the country.

The purity of the atmosphere of the hall, secured by the perfect ventilation, has already exerted a beneficial influence upon the health of those occupying it.

The last session—a long and laborious one—is remarkable for the fact that no member of the House present in Washington died during the session; and yet the House, I am informed, though it adjourned on the 14th of June, some two months earlier in the season than at any long session for years, was in actual session in the hall for some fifty hours more than in the longest session previously known; and passed more bills and transacted more business than ever before.

The Senate chamber is nearly ready for use. I had expected to have it completed by the first Monday in December, but I have been disappointed in some things upon which it depends, and I find it will now require a few weeks more time.

The causes of this delay it is not necessary here to recount. They were beyond my control.

The heating and ventilating apparatus for both wings is in condition for use. That in the south wing has been in constant use for nearly a year, and has given entire satisfaction. That for the north

wing is completed, and the building has been warmed by it, whenever necessary, for some months past.

The rooms of the Secretary of the Senate, the senators' retiring room, the ante-chamber, the corridors about the Senate, and a great part of the committee rooms of the north wing, are completed or nearly so.

In the ante-chamber of the Senate—a room magnificently decorated, and for which designs had been prepared to be painted in fresco on the walls—the proviso attached to the last appropriation for the Capitol extension has arrested the work. Spaces which had been prepared for the fresco painter therefore remain unfinished. The mere decoration of the room is complete, and the room can be used. At some future day it is to be hoped that these spaces will be filled by fresco paintings worthy of the room they should adorn, and of the magnificent building which contains it.

The proviso in relation to works of art, attached to the last appropriation, is as follows:

"Provided, that none of this appropriation shall be expended in embellishing any part of the Capitol extension with sculpture or paintings, unless the designs for the same shall have undergone the examination of a committee of distinguished artists, not to exceed three in number, to be selected by the President; and that the designs which said committee shall accept shall also receive the subsequent approbation of the Joint Committee on the Library of Congress; but this provision shall not be so construed as to apply to the execution of designs heretofore made and accepted from Crawford and Rogers."

As the Joint Library Committee does not sit during the recess, it has been impossible, since the passage of this proviso, to submit designs to it. The immediate effect of its passage, therefore, was to arrest all paintings in progress intended for the Capitol extension, and to prevent the commencement of new ones.

In the rooms and corridors in which the decoration had been commenced, the merely decorative portion of the coloring was continued, but the spaces intended for pictures are left blank until, by some future action, Congress determines the mode of carrying out its views in regard to the embellishment of the building by works of art.

Mr. Walker, who was employed in painting a picture of the storming of Chepultepec, for the Military Committee room of the south wing, has been stopped in his work by this proviso. His picture was perhaps half finished at the time. It is to be hoped that it may be found possible to authorize him to complete it.

In regard to a permanent committee of artists, I venture to suggest here that there are some difficulties. It would be difficult to select three distinguished American artists whose reputation should be such as to entitle them to sit, without appeal, in judgment on the works of their brother artists, and whose pencils or chisels could at the same time be spared from the decoration of the building.

There are few artists yet in this country qualified, by practice and by reputation, for such historical works as ought to adorn the panels in the legislative halls, and the spaces reserved for pictures in the

grand staircases and in the ante-chamber of the Senate and other public rooms.

It is to be feared, too, that without some special provision for procuring designs, artists will not be forward in supplying them. The preparation of a design for a historical picture is a work of study, of labor, and of time. An artist's time is too valuable to him to be given without compensation on the chance of success embraced in the approval of designs by two separate committees, one of them consisting of artists whom he may think superior or inferior to himself.

The most liberal and, it seems to me, most judicious mode of granting commissions for works of art, would be to constitute some body with the power to give to such artists as may have established a sufficient reputation, commissions at a fixed price for pictures to fill certain panels; or to grant to one artist a commission to decorate one of the great staircases, leaving the subject and the mode of treatment to the artist, subject only to the revision of the committee granting the commission. An artist who thus received a commission would have the certainty of compensation for all the labor and time he spent upon his work. It is a matter of course that an artist, honored by a liberal commission from the country for a picture to be placed in the Capitol, to be seen and criticised by all, would do his best.

But little historical painting has thus far been attempted in the Capitol extension. What little has been done has been done with the object of calling attention to the subject, and indicating the mode in which the building admits of decoration by works of art. As public attention has been called to it, my object has been accomplished, and I shall be ready to carry out, so far as depends upon my sphere of duty, any plan which the friends of art succeed in passing through Congress.

The sculpture from Mr. Crawford's designs for one of the eastern pediments has been nearly finished. No design has yet been adopted for the other. It is to be hoped that Congress will make some provision for it at the approaching session.

The contractors for marble have delivered a very large quantity of this material during the past year, but their quarry has not proved capable of supplying the shafts of the columns in single blocks, as required by the supplemental contract of 30th March, 1854, under the joint resolution of 20th February, of that year.

After a long correspondence the contractors offered to deliver the column shafts in single blocks from the quarries of Carrara, Italy; one of them proposing to deliver them at the Capitol, according to the terms of the contract, substituting, however, the Carrara marble for that of the Lee quarry, which it was impossible to procure in large enough blocks; the other member of the firm proposing to deliver them upon the dock in Washington; the price to be the same as that provided by the contract, viz: $1,400 for each shaft in a single piece.

This proposition you did not think it proper to accept, and the advertisement below was issued by your direction:

PROPOSALS FOR SHAFTS.

U. S. CAPITOL EXTENSION AND WASHINGTON AQUEDUCT OFFICE,
Washington, September 30, 1858.

Sealed proposals will be received at this office until the fourth day of December next, at noon, for furnishing, on the grounds of the extension of the Capitol, one hundred shafts for the columns of the exterior porticos of that building.

The dimensions are as follows:

One hundred shafts, including the upper torus of the base; each shaft to be twenty-five feet two and one-eighth inches in height from the bottom of said torus to the top of the upper astragal.

The diameter of the torus or bottom piece of shaft to be three feet seven and five-eighths inches; the diameter of the shaft above the base to be three feet, and at the neck below the capital two feet six and one-eighth inches; and the diameter of the upper astragal to be two feet eleven and-seven eighths inches. These are the net dimensions of the work when finished.

All the blocks to be scabbled round to dimensions, and to be free from all defects which would make blemishes in the finished columns.

The above shafts to be of white American marble, similar in color, grain, and composition to that used in the exterior of the Capitol extension, which comes from near Lee, Massachusetts.

Every proposal should be accompanied with a block at least one cubic foot in size, as a specimen of the marble offered. This specimen will be submitted to proper chemical and mechanical tests before being accepted for the work.

The proposals should state the time within which the marble will be delivered, and should be accompanied by a written guarantee, signed by one or more responsible persons, to the effect that he or they undertake that the bidder or bidders will, if his or their bids be accepted, enter into an obligation within ten days, with good and sufficient securities, for the completion of the work undertaken; said guarantee to be accompanied by the certificate of the United States district judge, United States district attorney, navy agent, or some officer of the general government, or individual known to the engineer or Department of War, that the guarantors are able to make good their guarantee.

The United States reserves the right to reject any or all bids not deemed advantageous, and to make other arrangements for procuring the marble.

Proposals will be received for furnishing the shafts either in single blocks or in blocks of not less than four feet in length, and the number of shafts offered in single blocks or in pieces, respectively, should be stated.

Proposals will be opened in this office at noon of the 4th of December next, in the presence of bidders who may choose to be present.

By order of the Secretary of War.

M. C. MEIGS,
Captain of Engineers, in charge of U. S. Capitol Extension.

FORM OF A GUARANTEE.

Captain M. C. MEIGS, *Unit d States Engineers:*

We the undersigned, residents of ——————, in the State of ——————, hereby, jointly and severally, covenant with the United States, and guaranty, in case the foregoing bid of ———— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute the contract for the same, with good and sufficient sureties, to perform the work or furnish the articles proposed, in conformity to the terms of the advertisement under which it was made. And in case the said ———— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ———— and the next lowest bidder.

A. B.
C. D.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

E. F.

The whole quantity of marble delivered by the contractors in the twelve months ending 30th September, is 74,789 cubic feet, costing $140,154 94.

The principal marble work of the year has consisted of the piers of the arcades of the ten porticos, in which much progress has been made; the completion of the cell walls of the connecting corridors; fitting up of the senators' retiring room; the four great staircases; and the completion of the marble skirtings generally.

The senators' retiring room is lined throughout with polished marble. The ceiling, deeply moulded in polished Italian marble, is supported by Corinthian columns and pilasters of the same material. The niches and walls are lined with polished Tennessee marble.

The four great staircases are nearly finished. The stairs are of marble, and the landings and ceilings of marble are supported upon marble columns of the Corinthian style, highly polished. The effect, even in the present unfinished condition of these staircases, is very rich and magnificent.

The walls have been prepared with large plain spaces for pictures, and it is to be hoped that the painting of these pictures may not be long delayed.

The light has been arranged with a view to the introduction of three large historical pictures upon each of these four staircases, one in each to be about thirty feet by twenty feet in size.

A niche for the reception of a colossal statue is also provided upon the principal landing of each staircase.

There have been applied to this building, in Washington, during the past year, 147,404 days' work upon the United States pay-roll, and 96,152 days' work by those employed by the contractors about the building; in all, 243,556 days' work, which is exclusive of the large forces employed at the marble and granite quarries, and in the various private workshops, whose resources have been made available for the building.

CASH ACCOUNT.

Available September 30, 1857	$724,187 04
Appropriation of June 12, 1858	750,000 00
	1,474,187 04
Expended during the year ending September 30, 1858	1,130,910 26
Available September 30, 1858	343,276 78
All of which will probably be expended by the 1st of January next.	
Amount to be appropriated for the service of the year ending June 30, 1860	500,000 00

All of which is respectfully submitted by your obedient servant,

M. C. MEIGS,
Captain of Engineers, in charge
United States Capitol Extension.

Hon. JOHN B. FLOYD,
Secretary of War.

OFFICE OF THE EXTENSION OF THE UNITED STATES CAPITOL,
Washington, November 15, 1858.

SIR: I have the honor to report the progress of operations for rebuilding the dome of the Capitol.

At the date of my last annual report the brick work of the walls had been carried to within a foot or two of the top of the brackets on which the piers and columns of the peristyle rest. Some of the pillars of the principal story had been set, and others were being received and fitted.

During the past year the skeleton of the principal story in two stages, as high as the top of the cornice of the circular colonnade, has been finished, and the columns have all been set in their places. The height above the base of the iron work is 42½ feet.

The wrought iron boiler plate band, which connects the whole work, has been secured in its place, and the work made ready for winter.

The shell which covers this skeleton, with forms of architectural decoration, is now being prepared by Messrs. James Beebe & Co.,

at their works in New York, and will be ready to set early next season.

It embraces the interior and exterior pilasters and cornices; the window-frames and their mouldings; and the heavy balustrades which surmounts the exterior cornice, and will complete the principal story of the work.

I should be pleased to be able to report a greater progress in this work, but the want of cordial co-operation on the part of the architect associated with me has much interfered with the studies and drawings of the work. As it appears to me, he has much mistaken his authority and his duty; and, as it was a matter which could be settled only by the department, I have awaited its decision.

A careful estimate of the quantity of iron received for the dome, to the month of June last, shows that there had been received of

Cast iron	2,860,529 lbs.	=	1,277 tons.
Wrought iron	237,247 lbs.	=	106 tons.
	3,097,776		1,383

The greater part of this iron work was finished and in place upon the dome, and the total expenditure to that date having been $206,391 52, including all expenses for pay of officers and workmen; for making drawings and patterns; for demolishing and removing the old dome and re-building the masonry, and all other incidental expenses; I find that the cost of the iron work put up had averaged, per lb., 6⅔ cents.

This average should be diminished as the work progresses, for a large portion of the total expenditure, which is included in making it up, is properly chargeable upon the whole work; such as the first studies of drawings; demolition of the old dome; rebuilding of masonry to receive the iron work, machinery, derricks, engines, and tools for hoisting and fitting the iron work, &c.

A drawing, showing the present state of the work, accompanies this report.

CASH ACCOUNT.

Available September 30, 1857	$602,193 92
Expended to September 30, 1858	119,450 43
Available September 30, 1858	482,743 49

No appropriation was made at the last session, and none is asked this year, as the sum available will be sufficient for the service of the year.

Respectfully submitted.

M. C. MEIGS,
Captain of Engineers in charge.

Hon. JOHN B. FLOYD,
Secretary of War.

OFFICE OF THE EXTENSION OF THE CAPITOL,
Washington, November 15, 1858.

SIR: I have the honor to report the progress of the work upon the continuation of the Post Office building during the past year.

At the date of my last annual report, the exterior walls on the west front and a part of the north and east front had been raised to the level of the architrave, and two or three rooms of the west basement were occupied by the Post Office Department.

The cornice has now been set on a greater part of the west front. The columns and the capitals of the pilasters, about one-half of the architrave, and a small part of the cornice has been set upon the north front. The columns of the west front have also been set.

The gap in the east front, so long occupied by the old buildings of the city post office, has been filled to the top of the basement, and the marble is being rapidly set. The granite walls of the building facing on the courtyard, are nearly completed.

The city post office has for many months occupied the rooms appropriated to it in the north basement, and in the pavilion.

The basement rooms of the west front generally are occupied, either by the Post Office Department or the city post office.

The roof is being put upon the west and north fronts. It is of corrugated copper, resting upon wrought iron H rafters, similar in construction to those of the Capitol extension.

The roof will probably be put upon the whole building early next season.

The rooms of the principal story of the west front are being plastered and prepared for use.

Some progress has been made in preparing the steam pipes and other parts of the heating apparatus; but the construction of the vaults and boilers cannot be completed until spring.

The whole of the twenty-eight Italian marble shafts for the porticos have been turned in the lathe at the shops of the Capitol extension without accident, and with an accuracy, beauty, and economy, not attainable by hand.

There have been received during the year: 1 Italian marble column shaft, 1,285 cubic feet of Italian marble, 9,520 cubic feet of Lee marble, 1,672 cubic feet of Baltimore marble, 13,911 cubic feet of granite. 1,164,300 bricks have been laid, and 78,007 days' work have been applied to the building, besides the labor at the quarries and in the private work shops from which the iron and other work has been procured.

The capitals for most of the columns and pilasters are finished, and the marble cutters are engaged principally in carving the enrichments of the Corinthian cornice.

Photographic drawings, showing the condition of the different fronts, accompany this report.

CASH ACCOUNT.

Amount available September 30, 1857	$308,289 08
Appropriation of January 12, 1858	100,000 00
	408,289 08
Expended in year ending September 30, 1858	330,530 08
Available September 30, 1858	77,759 00

All of which will be expended by March 4, 1859.

Appropriation required for year ending June 30, 1860	$150,000 00

Respectfully submitted,

M. C. MEIGS,
Captain of Engineers in charge.

Hon. J. B. FLOYD,
Secretary of War.

XV.

HEADQUARTERS OF THE ARMY,
New York, November 13, 1858.

SIR: The tables giving the numbers and distribution of our troops will be laid before you by the adjutant general. The object of this, my annual report, being to offer some general remarks on the recent services, general condition, and wants of the army. The annexed General Order (No. 22) will illustrate in some instances (omitting many) the extraordinary zeal, activity, patient endurance, and prowess habitually displayed by the troops—officers and men—in the perpetually recurring wars with the Indians about our border settlements. Thus, with an average effective force of say ten thousand men, exclusive of recruits in depot and in route, less by at least three regiments than is needed, the army has been for years, in nearly all its parts, almost constantly engaged in the pursuit of enemies, or in daily expectation of being called upon to repeat such services. This state of excessive activity, fatigue, and hardship has led to excessive losses, more from disease and desertion than from battles or combats, the greater part of which may be primarily attributed to *deficiency in numbers*.

This want of troops to give reasonable security to our citizens in distant settlements, including emigrants on the plains, can scarcely be too strongly stated; but I will only add, that as often as we have been obliged to withdraw troops from one frontier in order to reinforce another, the weakened points have been instantly attacked or threatened with formidable invasion. Minnesota, Arizona, and the northern frontiers of Texas and Arkansas, have recently supplied striking illustrations of this fact.

For the happy conclusion of long standing Indian troubles in Florida much credit is due to the energy and judgment of Colonel Loomis, the last commander in that war.

In New Mexico, Brevet Brigadier General Garland, an intelligent and enterprising commander, has used his limited force to the best advantage in punishing hostile, and in keeping in check turbulent Indians, besides detaching very handsome support in the handsomest manner, to the Utah army in its embarrassments of the last winter. Colonel Bonneville, who has recently succeeded General Garland in this command, is carrying out the views of the latter with like perseverance and success.

The cheerfulness and efficiency of the Utah army, under its very able commander, Brevet Brigadier General Johnston, notwithstanding its difficult marches and unavoidable privations, have won for it a large portion of the admiration of the country.

In Texas, Brevet Major General Twiggs has, with his usual ability, made the most effective disposition of the force at his command, resulting already in substantial and brilliant successes, which he purposes to follow up, if necessary, in a winter campaign.

In the Pacific department, Brevet Brigadier General Clarke, the commander, has displayed an energy and judgment worthy of high

commendation. Upon the first news of recent hostilities in that quarter, his measures were rapidly and wisely taken. Troops and supplies were promptly assembled near the theatre of operation; and under his immediate direction two columns, commanded by Colonel Wright and Major Garnett, respectively, were organized and put in motion against the enemy. Successive victories have already caused most of the hostile bands to disperse or sue for peace, which, no doubt, will soon be re-established. [I learn, in the act of signing this report, that my prediction is now history.]

The department of the west has recently been commanded, in succession, by Brigadier General Harney, Colonel Sumner, and Colonel Francis Lee. Garrisons have been established and strengthened in it, along the emigrant route to the west, and, for months, a column of cavalry was kept in movement on the plains to overawe disaffected tribes. The troops in Minnesota and on the upper Missouri, have also continued to render valuable service in restraining the Indians from committing massacres and depredations in that quarter.

On the many and formidable roving tribes on this side of and in the Rocky mountains, not in open hostility, but yet of doubtful or menacing dispositions, and whose depredations would soon have called for direct punishment, a great moral effect has been incidentally produced by our display of force in the direction of Utah. These large moving columns have been seen, and the power of the United States to some little extent, for the first time in those regions, estimated and feared. Such displays often repeated, and in sufficient numbers, combined with feats of arms like those set forth in the annexed order, can alone give the security for which the army is held responsible.

From the distribution of the troops into fragments, an increase of the regular medical officers has become a necessity. Sometimes private physicians may be hired, but not always, and rarely of the required science and experience even at extravagant rates of compensation. No less than six posts in a single department have been recently reported to me as without a medical officer.

I must also again beg attention to the miserable state of the barracks or quarters at nearly all our permanent fortifications and posts. Health and efficiency as well as comfort must be sacrificed where strict attention is not given to the lodgings of men.

Incessant calls for reinforcements received from the frontiers compel us, habitually, to forward recruits without the instruction that should precede service in the field, and on joining their regiments, perhaps in the act of pursuing an enemy, it is long before the deficiency can be supplied. The want of this instruction has always been felt in combats, notwithstanding the usual gallantry of the troops.

As it is no longer difficult to fill our ranks by enlistment, it would be highly desirable to detain the recruits sufficiently long for instruction at our larger depots, especially those destined for the mounted service; but again, this cannot be done without some additional regiments.

The institution of the artillery school at Fort Monroe will leave nothing to be desired for that arm, after we shall be at liberty to withdraw from the field the additional companies (three) which are

needed. The school will then consist of eight companies, two from each regiment, alternating every two years, with some other companies of their regiments. Thus, with two mounted companies, one-third of each artillery regiment would at all times be engaged in acquiring, with the best help, the difficult theory and practice of artillery, while the other two-thirds would in emergencies be available for infantry service as heretofore. For such instruction there will be required, as the department is aware, an appropriation to add to the government lands about Fort Monroe, (for exercise of field batteries and long ranges of heavy guns,) before the school can receive its full development. Without waiting for this extension, however, a systematic course of instruction has been commenced under Colonel Brown, the superintendent, and its progress is already satisfactory.

There is, in the circumstances of our service, no reasonable distinction between the three arms now recognised as mounted riflemen, dragoons, and cavalry; if, indeed, the law intended any between the two latter. Their fields of operation and duties generally are in all respects the same, and whatever variations exist in uniform and equipment, only serves to create inconvenience and extra expense. I therefore recommend that the three corps be consolidated into one line of cavalry regiments, (five,) for the tactics and equipment of which I suggest that the experience of a select board of cavalry officers be consulted.

It is my duty to present the fact that reports come to me from some quarters, of the injurious effects upon discipline produced by the neglect of the law requiring that the troops shall be paid *at least* once in two months, it being understood that the pay department has not the number of deputies necessary to approach regularity at any of the more distant posts. Drunkenness, disorders, and desertions are the consequences of the larger payments which are made at long intervals,

I have the honor to be, sir, with high respect, your most obedient servant,

WINFIELD SCOTT.

Hon. J. B. FLOYD,
Secretary of War.

XVI.

A.—*Organization of the regular army*

	Major general.	Brigadier generals.	Adjutant general.	Assistant adjutant general, (lieutenant colonel.)	Assistant adjutants general, (majors by brevet.)	Assistant adjutants general, (captains by brevet.)	Judge advocate.	Inspectors general.	Quartermaster general.	Assist. quartermasters general.	Dep. quartermasters general.	Quartermasters.	Assistant quartermasters.	Commissary general of subsistence.	Assistant commissary general of subsistence.	Commissaries of subsistence, (majors.)	Commissaries of subsistence, (captains.)	Surgeon general.	Surgeons.	Assistant surgeons.	Paymaster general.	Deputy paymasters general.	Paymasters.
General officers	1	3																					
Aids-de camp to general officers																							
Adjutant general's department			1	1	4	†8																	
Judge advocate's department							†1																
Inspector general's department								2															
Quartermaster's department									1	2	2	4	†28										
Subsistence department														1	1	2	†8						
Medical department																		1	26	80			
Pay department																					1	2	25
Corps of engineers																							
Corps of topographical engineers																							
Ordnance department																							
1st regiment of dragoons																							
2d regiment of dragoons																							
Aggregate of dragoons																							
1st regiment of cavalry																							
2d regiment of cavalry																							
Aggregate of cavalry																							
Regiment of mounted riflemen																							
1st regiment of artillery																							
2d regiment of artillery																							
3d regiment of artillery																							
4th regiment of artillery																							
Aggregate of artillery																							
1st regiment of infantry																							
2d regiment of infantry																							
3d regiment of infantry																							
4th regiment of infantry																							
5th regiment of infantry																							
6th regiment of infantry																							
7th regiment of infantry																							
8th regiment of infantry																							
9th regiment of infantry																							
10th regiment of infantry																							
Aggregate of infantry																							
Non-commissioned staff, unattached to regiments																							
Grand aggregate	1	3	1	1	4	†8	†1	2	1	2	2	4	†28	1	1	2	†8	1	26	80	1	2	25

* The five aids-de-camp being taken from regiments, in the strength of which they are included, are, to avoid counting them *twice*, excluded from the columns "total commissioned" and "aggregate."

† *One* of the eight assistant adjutants general, (captains by brevet,) *four* of the twenty-eight assistant quartermasters, and *one* of the eight commissaries of subsistence, (captains,) belonging also to regiments, and being included in their strength, are, to avoid counting them *twice*, excluded from the columns "total commissioned" and "aggregate" of their respective departments. As the regimental and staff commissions held by these officers are of *unequal* grade, they are not affected by the provisions of the 7th section of the act of June 18, 1846. The like remark is applicable to the *judge advocate* of the army, who is also a captain in the ordnance department.

‡ By the act of March 3, 1853, section 9, a lieutenant of engineers, topographical engineers and ordnance, having served "fourteen years continuous service as lieutenant," is entitled to promotion to the rank of captain; but such promotion is not to increase the whole number of officers in either of said corps beyond the number previously fixed by law.

§ Under the 4th section of the act of April 29, 1812, "making further provision for the corps of engineers," one brevet second lieutenant is allowed to every "company." The number authorized is consequently 199. The number attached to the army was 43, on 1st of July, 1858, since when *fourteen* have become entitled to promotion.

‖ The adjutants of artillery and infantry, (14,) and *all* the regimental quartermasters, (19,) being taken from the subalterns, and as such accounted for in their several regiments, are excluded, as regimental *staff* officers, from the columns "total commissioned" and "aggregate."

¶ By the act of June 17, 1850, "to increase the rank and file of the army," &c., sec. 2, the President is authorized, whenever the exigencies of the service require it, to increase to 74 the number of privates in any company

XVI.

of the United States, July 1, 1858.

Colonels.	Lieutenant colonels.	Majors.	Captains.	Aids-de-camp.	Adjutants.	Regimental quartermasters.	First lieutenants.	Second lieutenants.	Brevet second lieutenants.	Military storekeepers.	Sergeant majors.	Quartermaster sergeants.	Principal or chief musicians.	Chief buglers.	Ordnance sergeants.	Hospital stewards.	Sergeants.	Corporals.	Buglers.	Musicians.	Farriers and blacksmiths.	Artificers.	Privates.¶	Enlisted men of ordnance.	Total commissioned.	Total enlisted.	Aggregate.
..	..	..	....	..	....	....	....	....	....	..	..	..	..	..	....	....	....	....	....	....	..	..	.....	....	4	.....	4
..	..	..	....	*5	...	....	....	....	....	..	..	..	..	..	....	...	....	....	....	....	..	..	.....	..	.....	.....	.....
..	..	..	....	..	....	....	....	....	....	..	..	..	..	..	....	....	....	....	....	....	..	..	.....	...	13	.....	13
..	..	..	....	..	....	....	....	....	....	..	..	..	..	..	....	....	....	....	....	....	..	..	.....	..	...	.....	.....
..	..	..	....	..	....	....	....	....	....	..	..	..	..	..	....	....	....	....	....	....	..	..	.....	....	2	.....	2
..	..	..	....	..	....	....	....	....	....	7	..	..	..	..	....	....	....	....	....	....	..	..	.....	...	40	.....	40
..	..	..	....	..	....	....	....	....	....	..	..	..	..	..	....	....	....	..	....	....	..	..	.....	..	11	.....	11
..	..	..	....	..	....	....	....	....	....	..	..	..	..	..	....	‡‡62	....	....	....	....	..	..	.....	....	107	62	169
..	..	..	....	..	....	....	....	....	....	..	..	..	..	..	....	....	....	....	....	....	..	..	.....	....	28	.....	28
1	2	4	‡13	..	....	....	12	11	§4	..	..	..	..	..	....	..	10	10	..	8	..	..	78	...	47	100	147
1	1	4	‡16	..	....	....	10	4	§4	..	..	..	..	..	....	....	....	....	....	....	..	..	.....	...	40	.....	40
1	1	4	‡17	..	....	....	12	1	§4	15	..	..	..	..	....	....	....	....	....	....	..	..	.....	400	55	400	455
1	1	2	10	..	1	‖1	10	10	§3	..	1	1	1	2	....	....	40	40	20	...	10	..	500	....	38	615	653
1	1	2	10	..	1	‖1	10	10	§2	..	1	1	1	2	....	....	40	40	20	...	10	..	500	....	37	615	652
2	2	4	20	..	2	‖2	20	20	§5	..	2	2	2	4	....	....	80	80	40	...	20	..	1000	..	75	1230	1305
1	1	2	10	..	1	‖1	10	10	§3	..	1	1	1	2	....	...	40	40	20	...	10	..	500	....	38	615	653
1	1	2	10	..	1	‖1	10	10	....	..	1	1	1	2	....	....	40	40	20	...	10		500	..	35	615	650
2	2	4	20	..	2	‖2	20	20	§3	..	2	2	2	4	....	..	80	80	40	...	20	..	1000	....	73	1230	1303
1	1	2	10	..	1	‖1	10	10	§3	..	1	1	1	2	....	....	40	40	20	...	20	..	640	....	38	765	803
1	1	2	12	..	‖1	‖1	24	12	§2	..	1	1	..	..	...	....	48	48	...	24	..	24	**548	....	54	694	748
1	1	2	12	..	‖1	‖1	24	12	§2	..	1	1	..	..	....	....	48	48	...	24	..	24	**548	....	54	694	748
1	1	2	12	..	‖1	‖1	24	12	§2	..	1	1	..	..	....	....	48	48	...	24	.	24	**548	....	54	694	748
1	1	2	12	..	‖1	‖1	24	12	§2	..	1	1	..	..	....	....	48	48	...	24	..	24	**528	....	54	672	726
4	4	8	48	..	‖4	‖4	96	48	§8	..	4	4	..	..	....	....	192	192	...	96	..	96	**2170	..	216	2754	2970
1	1	2	10	..	‖1	‖1	10	10	§1	..	1	1	2	..	..	....	40	40	...	20	..	..	420	....	35	524	559
1	1	2	10	..	‖1	‖1	10	10	§1	..	1	1	2	..	....	...	40	40	...	20	..	..	420	..	35	524	559
1	1	2	10	..	‖1	‖1	10	10	§2	..	1	1	2	..	....	....	40	40	...	20	..	..	420	....	36	524	560
1	1	2	10	..	‖1	‖1	10	10	§1	..	1	1	2	..	....	....	40	40	...	20	..	..	420	...	35	524	559
1	1	2	10	..	‖1	‖1	10	10	§2	..	1	1	2	..	....	...	40	40	...	20	..	..	420	...	36	524	560
1	1	2	10	..	‖1	‖1	10	10	§1	..	1	1	2	..	....	...	40	40	...	20	..	..	420	....	35	524	559
1	1	2	10	..	‖1	‖1	10	10	§1	..	1	1	2	..	....	....	40	40	...	20	..	..	420	....	35	524	559
1	1	2	10	..	‖1	‖1	10	10	§1	..	1	1	2	..	....	....	40	40	...	20	..	..	420	....	35	524	559
1	1	2	10	..	‖1	‖1	10	10	§1	..	1	1	2	..	....	...	40	40	...	20	..	..	420	...	35	524	559
1	1	2	10	..	‖1	‖1	10	10	§1	..	1	1	2	..	....	....	40	40	..	20	..	..	420	....	55	524	559
10	10	20	100	..	‖10	‖10	100	100	§12	..	10	10	20	..	....	...	400	400	...	200	..	..	4200	....	352	5240	5592
..	..	..	....	..	....	....	....	....	....	..	..	..	..	..	77	....	....	....	....	....	..	..	.....	..	....	77	77
22	23	50	244	*5	‖19	‖19	280	214	§43	22	19	19	25	10	††77	‡‡62	802	802	100	298	60	96	¶908	400	1101	11858	12959

"serving at the several military posts on the western frontier, and at remote and distant stations." In the table the minimum or fixed organization is given, viz: 50 privates to a company of dragoons, 64 to a company of light artillery and riflemen, and 42 to one of artillery and infantry. Under the authority vested in him, the President has directed that the number of privates be carried up to 74 in the several companies serving in the peninsular of Florida and on the islands adjacent to it; in Kansas, Nebraska, Utah, Texas, New Mexico, California, Oregon, and Washington Territories, as well as in those stationed at Fort Ripley, on the Upper Mississippi; Fort Ridgely, on the Minnesota river; and Fort Arbuckle, on the Wild Horse Creek. There being 183 companies serving at, or in route to, these distant stations, the authorized increase in the number of privates is 5,206; making the "total enlisted" (as the troops are now posted or in route) 17,064, and the "aggregate" 18,165. If *all* the companies belonging to "regiments" (198) were serving at the distant stations described, the additional number of privates allowed would then be 5,642, thus increasing the "total enlisted" to 17,500, and the "aggregate" to 18,601.

** *Two* companies in each of the first three regiments of artillery, and *one* in the 4th, being equipped as light artillery, are allowed in consequence, "64" instead of 42 privates per company. See act "to increase the rank and file of the army," &c., approved June 17, 1850, section 1.

†† By the act of April 5, 1832, section 2, "providing for the organization of the ordnance department," the number of ordnance sergeants cannot exceed "*one* for each military post."

‡‡ By the act of August 16, 1856, section 2, "providing for a necessary increase and better organization of the medical and hospital department of the army," the number of hospital stewards cannot exceed "*one* for each military post."

S. COOPER, *Adjutant General.*

ADJUTANT GENERAL'S OFFICE, *Washington, November* 30, 1858.

B.—*General return or exhibit of the actual strength of*

	Major general.	Brigadier generals.	Adjutant general.	Assistant adjutant general, (lieutenant colonel.)	Assistant adjutants general, (majors by brevet.)	Assistant adjutants general, (captains by brevet.)	Judge advocate.	Inspectors general.	Quartermaster general.	Asst. quartermasters general.
General officers	1	3	.....	.....	.....	.....	.....	.....	.....	.....
Aids-de-camp to general officers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Adjutant general's department	.....	.....	1	1	4	*8	.....	.....	.....	.....
Judge advocate's department	.....	.....	.....	.....	.....	.....	*1	.....	.....	.....
Inspector general's department	.....	.....	.....	.....	.....	.....	.....	2	.....	.....
Quartermaster's department	.....	.....	.....	.....	.....	.....	.....	.....	1	2
Subsistence department	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Medical department	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pay department	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corps of engineers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corps of topographical engineers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ordnance department	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1st regiment of dragoons	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2d regiment of dragoons	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aggregate of dragoons	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1st regiment of cavalry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2d regiment of cavalry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aggregate of cavalry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Regiment of mounted riflemen	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1st regiment of artillery	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2d regiment of artillery	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3d regiment of artillery	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4th regiment of artillery	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aggregate of artillery	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1st regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2d regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3d regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4th regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5th regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6th regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7th regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8th regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9th regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10th regiment of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aggregate of infantry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Non-commissioned staff unattached to regiments	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Military Academy detachments	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cavalry recruiting depot, Carlisle barracks, Pa	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Principal recruiting depot, Fort Columbus, N. Y	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Recruiting depot, Newport barracks, Ky	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Recruits in rendezvous, and en route	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aggregate of detachments, at depots, rendezvous, &c.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grand aggregate	1	3	1	1	4	*8	*1	2	1	2

* *One* of the eight assistant adjutants general, (captains by brevet,) *four* of the twenty-eight assistant quarter
cluded in their strength, are, to avoid counting them *twice*, excluded from the columns "total commissioned"
officers are of *unequal* grade, they are not affected by the provisions of the 7th section of the act of June 18,
department.

the army of the United States on the 1st of July, 1858.

Deputy quartermasters general.	Quartermasters.	Assistant quartermasters.	Commissary general of subsistence.	Assistant commissary general of subsistence.	Commissaries of subsistence, (majors.)	Commissaries of subsistence, (captains.)	Surgeon general.	Surgeons.	Assistant surgeons.	Paymaster general.	Deputy paymasters general.	Paymasters.	Colonels.	Lieutenant colonels.	Majors.	Captains.
2	4	*28														
			1	1	2	*8										
							1	26	80							
										1	2	25				
													1	2	4	13
													1	1	4	16
													1	1	4	17
													1	1	2	10
													1	1	2	10
													2	2	4	20
													1	1	2	10
													1	1	2	10
													2	2	4	20
													1	1	2	9
													1	1	2	12
													1	1	2	12
													1	1	2	12
													1	1	2	12
													4	4	8	48
													1	1	2	10
													1	1	2	10
													1	1	2	10
													1	1	2	10
													1	1	2	10
													1	1	2	10
													1	1	2	10
													1	1	2	10
													1	1	2	10
													1	1	2	10
													10	10	20	100
2	4	*28	1	1	2	*8	1	26	80	1	2	25	22	23	50	243

masters, and *one* of the eight commissaries of subsistence, (captains,) belonging also to regiments, and being in- and "aggregate," of their respective departments. As the regimental and staff commissions held by these 1846. The like remark is applicable to the *judge advocate* of the army, who is also a captain in the ordnance

B.—*General return or exhibit of the actual strength*

	Aids-de-camp.	Adjutants.	Regimental quartermasters.	First lieutenants.	Second lieutenants.	Brevet second lieutenants.	Military storekeepers.	Sergeant majors.	Quartermaster sergeants.
General officers	....	.....	.....	.....	.....	.....	.....	.....	.....
Aids-de-camp to general officers	*5	.....	.....	.....	.....	.....	.....	.....	.....
Adjutant general's department	....	.....	.....	.....	.....	.....	.....	.....	.....
Judge advocate's department	....	.....	.....	.....	.....	.....	.....	.....	.....
Inspector general's department	....	.....	.....	.....	.....	.....	.....	.....	.....
Quartermaster's department	....	.....	.....	.....	.....	.....	7	.....	.....
Subsistence department	....	.....	.....	.....	.....	.....	.....	.....	.....
Medical department	....	.....	.....	.....	.....	.....	.....	.....	.....
Pay department	....	.....	.....	.....	.....	.....	.....	.....	.....
Corps of engineers	....	.....	.....	12	11	4	.....	.....	.....
Corps of topographical engineers	....	.....	.....	10	4	4	.....	.....	.....
Ordnance department	....	.....	.....	12	1	4	15	.....	.....
1st regiment of dragoons	....	1	†1	10	10	3	.....	1	1
2d regiment of dragoons	....	1	†1	9	10	2	.....	.....	1
Aggregate of dragoons	....	2	†2	19	20	5	.....	1	2
1st regiment of cavalry	....	1	†1	10	10	3	.....	1	1
2d regiment of cavalry	....	1	†1	10	10	.....	.....	.....	1
Aggregate of cavalry	....	2	†2	20	20	3	.....	1	2
Regiment of mounted riflemen	....	1	†1	10	10	3	.....	.....	1
1st regiment of artillery	....	†1	†1	24	12	2	.....	1	1
2d regiment of artillery	....	†1	†1	24	12	2	.....	1	1
3d regiment of artillery	....	†1	†1	24	12	2	.....	1	1
4th regiment of artillery	....	†1	†1	24	12	2	.....	1	1
Aggregate of artillery	....	†4	†4	96	48	8	.....	4	4
1st regiment of infantry	....	†1	†1	10	10	1	.....	.....	1
2d regiment of infantry	....	†1	†1	10	10	1	.....	1	1
3d regiment of infantry	....	†1	†1	10	10	2	.....	1	1
4th regiment of infantry	....	†1	†1	10	10	1	.....	1	1
5th regiment of infantry	....	†1	†1	10	10	2	.....	1	1
6th regiment of infantry	....	†1	†1	10	10	1	.....	1	1
7th regiment of infantry	...	†1	†1	10	10	1	.....	1	1
8th regiment of infantry	...	†1	†1	10	10	1	.....	1	1
9th regiment of infantry	....	†1	†1	10	10	1	.....	1	1
10th regiment of infantry	....	†1	†1	10	10	1	.....	1	1
Aggregate of infantry	....	†10	†10	100	100	12	.....	9	10
Non-commissioned staff unattached to regiments	....	.....	.....	.....	.....	.....	.....	.....	.....
Military Academy detachments	....	.....	.....	.....	.....	.....	.....	.....	.....
Cavalry recruiting depot, Carlisle barracks, Pa.	....	.....	.....	.....	.....	.....	.....	.....	.....
Principal recruiting depot, Fort Columbus, N. Y.	...	.....	.....	.....	.....	.....	.....	.....	.....
Recruiting depot, Newport barracks, Ky	....	.....	.....	.....	.....	.....	.....	.....	.....
Recruits in rendezvous, and en route	....	.....	.....	.....	.....	.....	.....	.....	.....
Aggregate of detachments, at depots, rendezvous, &c.	....	.....	.....	.....	.....	.....	.....	.....	.....
Grand aggregate	*5	†19	†19	279	214	43	22	15	19

* The five aids-de-camp, being taken from regiments in the strength of which they are included, are, to avoid counting them *twice*, excluded from the columns "total commissioned" and "aggregate."

† The adjutants of artillery and infantry (14) and *all* the regimental quartermasters, (19,) being taken from the subalterns, and as such accounted for in their several regiments, are excluded as regimental *staff* officers from the columns "total commissioned" and "aggregate."

‡ The "number of recruits required" are calculated for each regiment according to the stations of its several companies on the 1st of July, 1858, the number of *privates* ranging according to station, as explained in note (¶) to table A, showing the legal organization of the army.

of the army of the United States—Continued.

Principal or chief musicians.	Chief buglers.	Ordnance sergeants.	Hospital stewards.	Sergeants.	Corporals.	Buglers.	Musicians.	Farriers and blacksmiths.	Artificers.	Privates.	Enlisted men of ordnance.	Total commissioned.	Total enlisted.	Aggregate.	Number of recruits required.†
....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	4	.....
....	....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
....	....	..	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	.....	13	.....
....	....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
....	....	..	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	2	.....
....	....	...	.....	.....	.....	.....	.....	....	.....	.....	.....	40	.....	40	.....
....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	11	.....
....	...	....	62	.....	.....	.....	.....	.....	.....	.....	.....	107	62	169	.....
....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28	.....	28	.....
....	....	..	.....	8	7	.....	1	.....	38	45	.....	47	99	146	1
....	....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	40	.....	40	.....
....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	369	55	369	424	31
....	2	....	.....	39	35	16	.....	9	.....	569	.....	38	672	710	183
....	1	....	.....	40	33	19	.....	7	.....	479	.....	36	580	616	275
..	3	....	.....	79	68	35	.....	16	.....	1,048	.....	74	1,252	1,326	458
...	2	....	.....	39	39	20	.....	9	.....	659	.....	38	770	808	85
1	1	....	.....	40	36	17	.....	8	.....	650	.....	35	754	789	101
1	3	....	.....	79	75	37	.....	17	.....	1,309	.....	73	1,524	1,597	186
1	2	....	.....	40	39	18	.....	19	.....	620	.....	37	740	777	125
....	....	....	.....	47	45	4	17	.....	17	776	.....	54	908	962	¶
....	....	....	.....	47	47	4	18	.....	20	596	.....	54	734	788	108
....	....	..	.....	46	45	3	16	.....	15	801	.....	54	928	982	106
...	....	....	.....	45	40	4	14	.....	16	465	....	54	586	640	416
....	....	....	.....	185	177	15	65	.....	68	2,638	.....	216	3,156	3,372	544
1	....	....	.....	37	39	.....	19	.....	.....	694	.....	35	791	826	53
2	....	...	.....	39	31	.....	15	.....	.....	416	.....	35	505	540	339
2	....	....	.....	40	36	.....	14	.....	.....	651	.....	36	745	781	99
1	....	....	.....	36	35	.....	20	.....	.....	568	.....	35	662	697	182
2	...	....	.....	35	30	.....	12	.....	.....	521	.....	36	402	438	442
1	....	....	.....	38	33	.....	17	.....	.....	490	.....	35	581	616	263
2	....	....	.....	40	39	.....	18	.....	.....	689	.....	35	790	825	54
2	....	...	.....	39	37	.....	19	.....	.....	623	.....	35	722	757	122
2	...	....	.....	38	35	20	.....	.....	.....	649	.....	35	746	781	98
2	...	....	.....	38	39	17	.....	.....	....	513	.....	35	611	646	233
17	....	....	.....	380	354	37	134	.....	.....	5,614	.....	352	6,555	6,907	1,885
....	....	77	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	77	77	.....
....	....	....	.....	5	6	2	.....	.....	.....	129	.....	.....	142	142	.....
....	...	..	.....	5	5	.....	1	.....	.....	440	....	.....	451	451	.....
1	....	....	.....	15	15	.....	24	.....	.....	622	.....	.....	677	677	.....
....	....	....	.....	4	5	.....	2	.....	.....	84	.....	.....	95	95	.....
....	....	....	.....	15	9	.....	16	.....	.....	1,160	.....	.....	1,200	1,200	.....
1	....	...	.....	44	40	2	43	.....	.....	2,435	.....	.....	2,565	2,565	.....
20	8	77	62	815	760	144	243	52	106	13,709	369	1,049	16,399	17,498	§665

§ The number of enlisted men necessary to complete the military establishment is obtained by deducting from the whole number of recruits required to fill up all the regiments, the several detachments at the Military Academy, the three depots, (Fort Columbus, Newport barracks, and Carlisle barracks,) and the recruits at rendezvous and in route. The whole number required for regiments and corps is 3,230; the number at the Military Academy, at depots, and in route, is 2,565; leaving 665 as the number of recruits required to fill up the establishment on the 1st of July, 1858.

¶ Excess of 86.

S. COOPER, *Adjutant General.*

ADJUTANT GENERAL'S OFFICE, *Washington, November* 30, 1858.

C —*Position and distribution of the troops in the Department of the East, commanded by Brigadier*

POSTS.	SITUATION.	COMMANDING OFFICERS.	GARRISONS. Number of companies.	GARRISONS. REGIMENTS.
				Department staff...
Fort Mackinac	Michilimackinac, Mich.....	Capt. H. C. Pratt, 2d artillery...	1	2d artillery.....
Fort Independence ...	Boston harbor, Mass.....	Capt. and Bvt. Maj. L. G. Arnold, 2d artillery.	1	2d artillery.....
Fort Adams	Newport, R. I.....	Capt. and Bvt. Lt. Col. J. B. Magruder, 1st artillery.	1	1st artillery.....
Fort Hamilton..... } Fort Lafayette..... }	Narrows, N. Y. harbor.....	Lt. Col. and Bvt. Col. J. Dimick, 2d artillery.	2	2d artillery.....
Fort McHenry	Baltimore, Md.....	Capt. and Bvt. Major W. H. French, 1st artillery.	1	1st artillery.....
Fort Monroe	Old Point Comfort, Va.....	Maj. and Bvt. Col. H. Brown, 2d artillery.	5	1st, 2d, and 4th art'y
Fort Moultrie.....	Charleston harbor, S. C....	Lt. Col. and Bvt. Col. J. L. Gardner, 1st artillery.	2	1st artillery.....
Barrancas Barracks...	Pensacola harbor, Fla.....	Capt. and Bvt. Lt. Col. J. H. Winder, 1st artillery.	1	1st artillery.....
Baton Rouge Barracks	Baton Rouge, La.....	Capt. J. B. Ricketts, 1st artillery.	1	1st artillery .....
Aggregate of	the department.....	.....	15	.....

NOTE.—The force in this department has been since increased from fifteen to sixteen companies, by trans-

ADJUTANT GENERAL'S OFFICE,
Washington, November 30, 1858.

and Brevet Major General John E. Wool.—Headquarters Troy, New York, June 30, 1858.

PRESENT.																													ABSENT.							PRESENT AND ABSENT.		
Brigadier general.	Assistant adjutant general, (major by brevet.)	Assistant adjutant general, (captain by brevet.)	Assistant quartermaster general.	Deputy quartermaster general.	Quartermaster.	Assistant quartermasters.	Assist. com'y gen'l of subsistence, (lieut. col.)	Commissaries of subsistence, (captains.)	Surgeons.	Assistant surgeons.	Deputy paymaster general.	Paymasters.	Colonel.	Lieutenant colonel.	Majors.	Captains.	Aids-de-camp.	Adjutant.	Regimental quartermaster.	First lieutenants.	Second lieutenants.	Brevet second lieutenant.	Military storekeeper.	Enlisted men.	Total commissioned.	Aggregate.	General and staff officers.	Field and regimental staff officers.	Captains.	Subalterns.	Enlisted men.	Total commissioned.	Aggregate.	Commissioned officers.	Enlisted men.	Aggregate.
1	1	..	..	..	1	2	1	2	1	..	1	3	..	..	..	..	2	..	..	..	..	..	..	4	15	19	..	..	..	..	..	..	....	15	4	19
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	1	..	..	66	3	69	..	..	..	1	..	1	1	4	66	70
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	1	1	..	..	61	4	65	..	..	..	1	..	1	1	5	61	66
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	2	1	..	..	67	5	72	..	..	..	..	..	..	....	5	67	72
..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	2	..	1	..	1	2	..	..	114	8	122	..	1	..	3	..	4	4	12	114	126
..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	2	1	..	..	78	5	83	..	..	..	..	..	..	....	5	78	83
..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	6	..	..	1	4	4	5	..	331	22	353	..	..	..	6	3	6	9	28	334	362
..	..	..	..	..	..	..	..	..	1	1	..	..	..	1	..	..	..	1	1	1	1	..	..	181	7	188	..	1	2	2	1	5	6	12	182	194
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	85	2	87	..	..	..	2	1	2	3	4	86	90
..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	1	..	..	52	3	55	..	..	..	2	..	2	2	5	52	57
1	1	..	..	..	1	2	1	2	5	5	1	3	..	2	1	14	2	2	2	12	12	5	..	1039	74	1113	..	2	2	17	5	21	26	95	1044	1139

fer to it from the Department of Florida of one company of the 1st artillery.

S. COOPER,
Adjutant General.

D.—*Position and distribution of the troops in the Department of Florida, commanded by*

POSTS.	SITUATION.	COMMANDING OFFICERS.	GARRISONS. Number of companies.	GARRISONS. REGIMENTS.
				Department staff.
Fort Brooke.....	Tampa, Southern Florida.....	1st Lt. T. Talbot, 1st artillery..	..	Detachment.....
Key West Barracks.	Key West island, Florida.....	Capt. J. M. Brannan, 1st artillery	1	1st artillery.....
Aggregate of	the department.....	....	1	.....

This department has been since merged in that of the East.

ADJUTANT GENERAL'S OFFICE, *Washington, November* 30, 1858.

Col. Gustavus Loomis, 5th infantry.—Headquarters Fort Brooke, Florida, June 30, 1858.

| PRESENT. | | |

E.—*Position and distribution of the troops in the Department of the West, commanded by*

POSTS.	SITUATION.	COMMANDING OFFICERS.	GARRISONS. Number of companies.	GARRISONS. REGIMENTS.
				Department staff...
Fort Ripley.....	Upper Mis-issippi, 6 miles south of the mouth of Crow Wing river, Minnesota.	Capt. and Bvt. Maj. G. W. Patton, 2d infantry.	2	2d artillery and 2d infantry.
Fort Ridgely.....	Minnesota river, 90 miles from Fort Snelling, Minnesota.	Lieut. Col. J. J. Abercrombie, 2d infantry.	3	2d infantry .....
Fort Randall.....	Missouri river, 65 miles above l'Eau qui Court, Nebraska.	Maj. H. Day, 2d infantry.....	1	2d infantry .....
Expedition to mouth of Yellow Stone river, on its return to Fort Randall.	On the Missouri river, two days' journey from Fort Randall.	Capt. and Bvt. Maj. H. W. Wessells, 2d infantry.	1	2d infantry .....
Fort Leavenworth..	Missouri river, 20 miles above the mouth of Kansas river, Kansas.	Capt. and Bvt. Major T. W. Sherman, 3d artillery.	5	2d and 3d artillery and 2d infantry.
Detachment (from Ft. Leavenworth.)	At Fort Scott, Kansas.....	Capt. N. Lyon, 2d infantry...	2	3d artillery and 2d infantry.
Fort Riley.....	Republican fork of Kansas river, Kansas.	Major and Bvt. Lieut. Col. M. Burke, 2d artillery.	1	2d artillery .....
Jefferson Barracks..	Near St. Louis, Missouri.....	Surgeon E. H. Abadie, medical department.	..	Invalids .....
Fort Arbuckle	Wild Horse Creek, west of Arkansas.	First Lieutenant J. E. Powell, 1st infantry.	1	1st infantry.....
En route.....	.....	First Lieutenant H. B. Hendershott, 2d infantry.	..	Recruits for 2d infantry.
Aggregate of	the department	.....	16	.....

NOTE.—The force in this department has been since increased from sixteen to twenty-eight companies, by ADJUTANT GENERAL'S OFFICE, *Washington, November* 30, 1858.

Colonel Francis Lee, 2d infantry.—Headquarters St. Louis, Missouri, June 30, 1858.

PRESENT.																													ABSENT.							PRESENT AND ABSENT.		
Brigadier general.	Assistant adjutant general, (major by brevet.)	Assistant adjutant general, (captain by brevet.)	Assistant quartermaster general.	Deputy quartermaster general.	Quartermaster.	Assistant quartermasters.	Commissaries of subsistence, (majors.)	Commissaries of subsistence, (captains.)	Surgeons.	Assistant surgeons.	Deputy paymaster general.	Paymasters.	Colonels.	Lieutenant colonels.	Majors.	Captains.	Aid-de-camp.	Adjutants.	Regimental quartermasters.	First lieutenants.	Second lieutenants.	Brevet second lieutenants.	Military storekeepers.	Enlisted men.	Total commissioned.	Aggregate.	General and staff officers.	Field and regimental staff officers.	Captains.	Subalterns.	Enlisted men.	Total commissioned.	Aggregate.	Commissioned officers.	Enlisted men.	Aggregate.
..	..	..	..	..	..	2	..	1	..	..	..	1	1	..	..	..	..	1	..	..	..	..	..	6	6	12	1	..	..	..	..	1	1	7	6	13
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	1	1	..	..	142	4	146	..	..	1	3	1	4	5	8	143	151
..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	3	..	..	..	1	1	..	..	123	7	130	..	..	..	2	1	2	3	9	124	133
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	1	..	..	1	..	1	..	..	65	5	70	..	..	..	2	..	2	2	7	65	72
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	41	1	42	..	..	..	..	..	..	..	1	41	42
..	..	..	1	..	..	2	..	1	1	1	..	..	..	..	..	5	..	..	..	3	3	..	1	337	18	355	3	..	1	2	6	6	12	24	343	367
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	2	..	..	..	1	1	..	..	112	5	117	..	..	..	3	1	3	4	8	113	121
..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	1	..	..	..	1	1	..	..	61	5	66	..	..	..	1	1	1	2	6	62	68
..	..	.	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11	1	12	..	..	..	..	..	..	..	1	11	12
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	1	..	..	75	3	78	..	..	1	..	..	1	1	4	75	79
..	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	..	..	257	3	260	..	..	..	..	..	..	..	3	257	260
..	..	..	1	..	..	4	..	2	3	6	..	1	1	1	2	14	..	1	1	9	11	..	1	1230	58	1288	4	..	3	13	10	20	30	78	1240	1318

the return of *ten* companies of the 1st cavalry, and *two* of the 2d artillery, from that destined for Utah.

S. COOPER, *Adjutant General.*

F.—*Position and distribution of the troops in the Department of Texas, commanded by Brigadier and*

POSTS.	SITUATION.	COMMANDING OFFICERS.	GARRISONS. Number of companies.	GARRISONS. REGIMENTS.
				Department staff.
Fort Belknap.....	Red Fork of Brazos river, Texas..	Capt. R. W. Johnston, 2d cavalry	1	2d cavalry and 1st infantry.
En route for or near Ft. Belknap, under orders to proceed to Kansas.	On Red and Clear Forks of Brazos river; on Perch Creek and Hubbard's Creek, Texas.	Maj. G. H. Thomas, 2d cavalry.	9	2d cavalry.....
Fort Chadbourne ...	Oak Creek, 30 miles above its junction with the Colorado, Texas.	Capt. J. H. King, 1st infantry ..	2	1st infantry....
Camp Colorado.....	6 miles north of Colorado river. on the road from Ft. Mason to Ft. Belknap, Texas.	Second Lt. J. H. Holman, 1st infantry.	..	Detachment of 1st infantry.
Fort KcKavett.....	San Saba river, 95 miles from Ft. Chadbourne, Texas.	Capt. J. B. Plummer, 1st infantry.	1	1st infantry....
Fort Lancaster	At the junction of Live Oak Creek with the Pecos river, El Paso road, Texas.	Capt. S. D. Carpenter, 1st infantry.	2	1st infantry....
Fort Davis	At the sources of the Limpia, 475 miles N.W. of San Antonio, Tex.	Lt. Col. W. Seawell, 8th infantry	4	8th infantry....
Fort Mason.....	Llano river, 110 miles W.N.W. of San Antonio, Texas.	Second Lieut. W. E. Burnet, 1st infantry.	..	Detachment of 1st infantry.
Camp Hudson	At the second crossing of San Pedro or Devil's river, El Paso road, 75 miles north of Ft. Clark, Tex.	Capt. and Bvt. Major L. Smith, 8th infantry.	2	8th infantry....
Camp Verde.....	Near Bandera Pass. 60 miles N.W. of San Antonio, Texas.	Second Lieut. W. M. Graham, 1st artillery.	..	Detachment of 1st artillery.
San Antonio Barr'ks.	San Antonio, Texas.....	Capt. B. H. Hill, 1st artillery...	1	1st artillery....
Fort Clark..... ...	Head of Las Moras river, 30 miles north of Ft. Duncan, Texas.	First Lieut. J. A. Mower, 1st infantry.	2	1st infantry....
Fort Inge.....	On the Leona river, 45 miles N.E. of Ft. Duncan, Texas.	Second Lieut. H. Biggs, 1st infantry.	..	Detachment of 1st infantry.
Fort Duncan.....	Eagle Pass, Texas.....	Maj. S. Burbank, 1st infantry..	2	1st infantry....
Fort McIntosh.....	Laredo, Texas.....	First Lieut. G. A. Williams, 1st infantry.	..	Detachment of 1st infantry.
Ringgold Barracks ..	Rio Grande City, Texas.....	First Lieut. J. E. Slaughter, 1st artillery.	1	1st artillery...
Fort Brown	Brownsville, Texas	Maj. and Bvt. Lt. Col. F. Taylor, 1st artillery.	1	1st artillery ....
Artesian Well Camp.	Near the junction of Delaware creek with the Pecos river, Tex.	Capt. J. Pope, Topographical Engineers.	..	Detachm't of 2d cav. & 8th inf.
Aggregate of	the department	.....	28	.....

ADJUTANT GENERAL'S OFFICE,
Washington, November 30, 1858.

Brevet Major General David E. Twiggs.—Headquarters San Antonio, Texas, June 30, 1858.

PRESENT.																													ABSENT.						PRESENT AND ABSENT.		
Brigadier general.	Assistant adjutant general, (major by brevet.)	Assistant adjutant general, (captain by brevet.)	Assistant quartermaster general.	Deputy quartermaster general.	Quartermaster.	Assistant quartermasters.	Commissary of subsistence, (major.)	Commissary of subsistence, (captain.)	Surgeons.	Assistant surgeons.	Deputy paymaster general.	Paymasters.	Colonel.	Lieutenant colonels.	Majors.	Captains.	Aid-de-camp	Adjutants.	Regimental quartermasters.	First lieutenants.	Second lieutenants.	Brevet second lieutenant.	Military storekeeper.	Enlisted men.	Total commissioned.	Aggregate.	General and staff officers.	Field and regimental staff officers.	Captains.	Subalterns.	Enlisted men.	Total commissioned.	Aggregate.	Commissioned officers.	Enlisted men.	Aggregate.
1	..	1	..	..	1	1	..	1	..	1	..	2	..	..	..	1	1	..	..	1	..	..	..	....	11	11	..	..	..	..	..	..	....	11	....	11
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	2	..	..	84	4	88	..	..	..	1	..	1	1	5	84	89
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	7	..	1	1	2	8	..	..	663	21	684	..	3	2	6	8	11	19	32	671	703
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	1	..	..	121	3	124	..	..	..	1	..	1	1	4	121	125
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	24	1	25	..	..	..	..	..	..	..	1	24	25
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	64	2	66	..	1	..	..	..	1	1	3	64	67
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	1	2	..	..	159	5	164	..	..	1	1	2	2	4	7	161	168
..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	3	..	1	1	..	2	..	..	236	9	245	..	..	1	1	2	2	4	11	238	249
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	20	1	21	..	..	..	..	..	..	....	1	20	21
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	1	..	..	152	3	155	..	..	1	1	2	2	4	5	154	159
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	26	1	27	..	..	..	..	..	..	....	1	26	27
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	60	2	62	..	..	..	..	..	..	....	2	60	62
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	1	..	..	135	3	138	..	..	2	..	2	2	4	5	137	142
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	23	1	24	..	..	..	..	..	..	....	1	23	24
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	1	..	1	..	..	..	..	..	145	4	149	..	3	1	2	..	6	6	10	145	155
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	25	1	26	..	..	..	..	1	..	1	1	26	27
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	1	..	..	79	3	82	..	..	1	1	1	2	3	5	80	85
..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	1	1	..	..	..	1	1	..	..	84	6	90	..	..	..	..	1	..	1	6	85	91
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	2	..	..	96	4	100	..	..	..	..	..	..	....	4	96	100
1	..	1	..	..	1	1	..	1	1	9	..	3	..	1	2	21	1	3	2	11	25	..	..	2196	85	2281	..	7	9	14	19	30	49	115	2215	2330

S. COOPER,
Adjutant General.

G.—*Position and distribution of the troops in the Department of New Mexico, commanded by Colonel and*

POSTS.	SITUATION.	COMMANDING OFFICERS.	GARRISONS. Number of companies.	GARRISONS. REGIMENTS.
				Department staff.....
Fort Garland.....	On Utah creek, in the Utah country, 85 miles north of Taos, New Mexico.	Capt. T. Duncan, mounted rifles.	1	Mounted rifles.....
Cantonment Burgwin.	Near the Rio Grande, 9 miles north of Taos, N. Mexico.	Capt. H. B. Schroeder, 3d infantry.	1	3d infantry.
Fort Union.....	On the Moro river, 50 miles N.E. of Santa Fé, N. Mexico.	Capt. A. J. Lindsay, mounted rifles.	2	Mounted rifles.....
Fort Defiance	In the Navajo country, 180 miles east of Santa Fé, N.M.	Capt. and Bvt. Maj. W. T. H. Brooks, 3d infantry.	3	Mounted rifles and 3d infantry.
Fort Marcy.....	Near Santa Fé, New Mexico..	Capt. and Bvt. Major J. T. Sprague, 8th infantry.	1	8th infantry.....
Camp Loring.....	Near Red river, New Mexico.	Second Lieut. L. S. Baker, mounted rifles.	1	Mounted rifles.....
Albuquerque.....	On the Rio Grande, N. Mexico	Col. B. L. E. Bonneville, 3d infantry.	..	Headquarters, 3d infantry.
Fort Craig.....	On the Rio Grande, near Valverde, New Mexico.	Capt. and Bvt. Lt. Col. D. T. Chandler, 3d infantry.	2	Mounted rifles and 3d infantry.
Fort Stanton.....	On the Bonito river, 20 miles east of the White mountain, New Mexico.	Capt. and Bvt. Lt. Col. J. V. D. Reeve, 8th infantry.	3	Mounted rifles and 8th infantry.
Fort Thorn.....	Near Santa Barbara, on the Rio Grande, New Mexico.	First Lieut. G. W. Howland, mounted rifles.	2	Mounted rifles and 3d infantry.
Fort Fillmore.....	On the Rio Grande, near Brasito, 40 miles above El Paso, New Mexico.	Lt. Col. D. S. Miles, 3d infantry.	2	3d infantry.....
Fort Bliss.....	Near El Paso, Texas	Maj. T. H. Holmes, 8th infantry.	2	Mounted rifles and 8th infantry.
Fort Buchanan.....	Near Tucson, New Mexico...	Capt. and Bvt. Maj. E. H. Fitzgerald, 1st dragoons.	2	1st dragoons .....
Aggregate of the	department.....	.....	22	.....

One company of mounted riflemen, and *three* companies of the 3d infantry, being the escort which, under belonging to this department, are omitted here, and are counted in Utah, where they were temporarily serving from 22 to 26.

ADJUTANT GENERAL'S OFFICE, *Washington, November* 30, 1858.

Bvt. Brig. Gen. John Garland, 8th infantry.—Headquarters Santa Fé, N. Mexico, June 30, 1858.

PRESENT.																													ABSENT.						PRESENT AND ABSENT.		
Brigadier generals.	Assistant adjutants general, (majors by brevet.)	Assistant adjutants general, (captains by brevet)	Assistant quartermasters general.	Deputy quartermasters general.	Quartermasters.	Assistant quartermasters.	Commissaries of subsistence, (majors.)	Commissaries of subsistence, (captains.)	Surgeons.	Assistant surgeons.	Deputy paymasters general.	Paymasters.	Colonels.	Lieutenant colonels.	Majors.	Captains.	Aids-de-camp.	Adjutants.	Regimental quartermasters.	First lieutenants.	Second lieutenants.	Brevet second lieutenants.	Military storekeepers.	Enlisted men.	Total commissioned.	Aggregate.	General and staff officers.	Field and regimental staff officers.	Captains.	Subalterns.	Enlisted men.	Total commissioned.	Aggregate.	Commissioned officers.	Enlisted men.	Aggregate.
..	..	1	..	..	..	2	1	..	1	..	..	2	1	..	..	1	1	..	..	..	..	..	1	3	11	14	..	..	..	..	..	....	....	11	3	14
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	79	2	81	..	..	..	..	..	...	....	2	79	81
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	57	2	59	..	1	..	2	7	3	10	5	64	69
..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	2	..	..	..	..	..	..	..	136	4	140	1	2	..	2	2	5	7	9	138	147
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	2	2	..	..	216	6	222	..	..	1	2	2	3	5	9	218	227
..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	1	..	..	..	64	3	67	..	..	..	..	..	...	....	3	64	67
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	72	1	73	..	..	1	1	..	2	2	3	72	75
..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	1	1	..	..	..	..	31	4	35	..	1	..	..	..	1	1	5	31	36
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	2	..	..	159	4	163	..	..	1	3	..	4	4	8	159	167
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	2	..	..	..	2	1	..	..	205	6	211	..	..	1	2	1	3	4	9	206	215
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	1	1	..	..	147	4	151	..	1	1	2	1	4	5	8	148	156
..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	2	..	..	148	4	152	..	..	2	1	..	3	3	7	148	155
..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	1	1	..	..	..	..	2	..	..	132	6	138	..	..	1	1	2	2	4	8	134	142
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	2	..	..	..	1	1	..	..	125	5	130	..	1	..	2	3	3	6	8	128	136
..	..	1	..	..	..	3	1	..	3	8	..	3	2	1	1	15	1	1	1	8	12	..	1	1574	62	1636	1	6	8	18	18	33	51	95	1592	1687

command of Col. Loring, regiment mounted rifles, accompanied Capt. Marcy on his return to Utah, though on the 30th June. They have since returned, increasing the number of companies serving in the department

S. COOPER, *Adjutant General.*

H.—*Position and distribution of the troops in the department of Utah, commanded by Brevet Brigadier*
tory, June

POSTS.	SITUATION.	COMMANDING OFFICERS.	Number of companies.	GARRISONS. REGIMENTS.
				Department staff.....
In the field	On West Creek, 16½ miles southwest of Great Salt Lake City, Utah Territory.	Col. and Bvt. Brig. Gen. A. S. Johnston, 2d cavalry.	37	Ordnance Department, 2d dragoons, 1st cavalry, mounted rifles, 4th artillery, 3d, 5th, 6th, 7th, and 10th infantry.
Fort Bridger	On Black Fork of Green river, about 2½ miles above Smith's Fork, Utah Territory.	Major and Bvt. Lieut. Col. W. Hoffman, 6th infantry.	3	1st cavalry and 6th infantry.
Aggregate of	the department.....	.....	40	.....

One company of mounted riflemen and *three* companies of the 3d infantry, though belonging to the department panied Captain Marcy on his return from New Mexico to Utah. These companies have since returned to New companies of the 6th infantry have been put in march for the department of Oregon. But, by the gain of *one* the department continues unchanged.

ADJUTANT GENERAL'S OFFICE, *Washington, November* 30, 1858.

General Albert S. Johnston, colonel second cavalry.—Headquarters Camp on West Creek, Utah Terri
30, 1858.

PRESENT.																																				ABSENT.							PRESENT AND ABSENT.		
Brigadier generals.	Assistant adjutants general, (majors by brevet.)	Assist. adjutants general, (captains by brevet.)	Assistant quartermasters general.	Deputy quartermasters general.	Quartermasters.	Assistant quartermasters.	Commissaries of subsistence, (majors.)	Commissaries of subsistence, (captains.)	Surgeons.	Assistant surgeons.	Deputy paymasters general.	Paymasters.	Colonels.	Lieutenant colonels.	Majors.	Captains.	Aids-de-camp.	Adjutants.	Regimental quartermasters.	First lieutenants.	Second lieutenants.	Brevet second lieutenants.	Military storekeepers.	Enlisted men.	Total commissioned.	Aggregate.	General and staff officers.	Field and regimental staff officers.	Captains.	Subalterns.	Enlisted men.	Total commissioned.	Aggregate.	Commissioned officers.	Enlisted men.	Aggregate.
..	..	1	..	..	..	1	..	1	1	1	.	1	1	..	..	2	1	..	..	2	..	..	..	4	12	16	..	..	..	..	..	..	..	12	4	16
..	..	..	..	..	..	..	..	..	..	5	..	..	3	3	1	20	..	3	3	20	30	..	..	2234	88	2322	..	2	8	4	18	14	32	102	2252	2354
..	..	..	..	..		..	..	..	..	1	..	..	..	..	1	2	..	..	..	3	2	.	1	264	10	274	..	..	1	..	..	1	1	11	264	275
..	..	1	..	..	..	1	..	1	1	7	..	1	4	3	2	24	1	3	3	25	32	..	1	2502	110	2612	..	2	9	4	1[illegible]	15	33	125	2520	2645

of New Mexico, are here counted, because here present on the 30th of June, being the escort which accom-
Mexico; the *two* companies of the 1st cavalry have been restored to the department of the West, and the *four*
company of the 3d artillery and *nine* more companies of the 7th infantry, the number of companies serving in

S. COOPER, *Adjutant General.*

I.—*Position of the reinforcements in march for Utah, commanded by Brig.*

POSTS.	SITUATION.	COMMANDING OFFICERS.	GARRISONS. Number of companies.	GARRISONS. REGIMENTS.
				Headquarters staff....
En route for Utah...	On west branch of Medicine Bow creek, opening a road between Cheyenne and Bridger's Passes, U T.	Lt. Col. G. Andrews, 6th infantry.	6	Engineer detachment and 6th infantry.
Fort Laramie.....	At the junction of Laramie river with the north fork of Platte river, Oregon route, Nebraska Territory.	Major J. Lynde, 7th infantry	1	7th infantry.....
En route for Utah...	Camp near Fort Laramie, Nebraska Territory.	Major L. P. Graham, 2d dragoons.	1	2d dragoons and recruits.
Do.	Camp near Fort Laramie, Nebraska Territory.	Major J. Sedgwick, 1st cavalry.	2	1st cavalry.....
En route for Platte Bridge.	On the north fork of the Platte, 17 miles west of Ash Hollow, Nebraska Territory.	Captain J. Roberts, 4th artillery.	2	4th artillery and recruits.
En route for Fort Laramie.	On the north fork of the Platte, 16 miles west of Ash Hollow, Nebraska Territory.	Lt. Col. and Bvt. Col. J. Munroe, 4th artillery.	3	4th artillery and recruits.
Fort Kearney.....	On the south bank of the Platte river, opposite Grand island, Nebraska Territory.	Captain J. P. McCown, 4th artillery.	1	4th artillery.....
En route for Utah...	At Fort Kearny, N. T., (escort to headquarters.)	Captain L. McLaws, 7th infantry.	1	7th infantry.....
Do.....	On the Platte, near Fort Kearney, Nebraska Territory.	Colonel E. V. Sumner, 1st cavalry.	3	1st cavalry.....
Do.....	On the Platte, near Fort Kearney, Nebraska Territory.	Maj. and Bvt. Col. C. A. May, 2d dragoons.	6	2d drag's, 2d and 4th art'y, and recruits.
Do.....	On the Platte, near Fort Kearney, Nebraska Territory.	Lieut. Colonel P. Morrison, 7th infantry.	5	2d artillery, 7th infantry, and recruits.
Do.....	On the Big Blue, 132 miles northwest of Leavenworth, K. T., Nebraska Territory.	Captain and Bt. Major D. P. Whiting, 7th infantry.	3	3d artillery and 7th infantry.
Do.....	On the Big Blue, near Marysville, 130 miles northwest of Leavenworth, K. T., Nebraska Territory.	Major W. H. Emory, 1st cavalry.	4	1st cavalry, 7th infantry, and recruits.
Aggregate	of the department.....	.....	38	.....

NOTE.—Of the above number of companies *two* of the 2d dragoons and *ten* of the 4th artillery have been turned to the department of the west; *one* company of the 3d artillery and *nine* of the 7th infantry have confantry have been ordered, and are on their march to the seat of war in Washington Territory.

ADJUTANT GENERAL'S OFFICE,
Washington, November 30, 1858.

General William S. Harney, Headquarters in the field, June 30, 1858.

PRESENT.																													ABSENT.						PRESENT AND ABSENT.		
Brigadier generals.	Assistant adjutants general, (majors by brevet.)	Assist. adjutants general, (captains by brevet.)	Assistant quartermasters general.	Deputy quartermasters general.	Quartermasters.	Assistant quartermasters.	Commissaries of subsistence, (majors.)	Commissaries of subsistence, (captains.)	Surgeons.	Assistant surgeons.	Deputy paymasters general.	Paymasters.	Colonels.	Lieutenant colonels.	Majors.	Captains.	Aids-de-camp.	Adjutants.	Regimental quartermasters.	First lieutenants.	Second lieutenants.	Brevet second lieutenants.	Military storekeepers.	Enlisted men.	Total commissioned.	Aggregate.	General and staff officers.	Field and regimental staff officers.	Captains.	Subalterns.	Enlisted men.	Total commissioned.	Aggregate.	Commissioned officers.	Enlisted men.	Aggregate.
1	..	1	..	1	..	1	..	..	1	..	..	2	..	1	..	2	1	..	..	..	.	..	..	2	11	13	..	..	..	..	..	..	....	11	2	13
..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	5	..	1	1	3	6	1	..	349	18	367	..	1	1	1	5	3	8	21	354	375
..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	1	1	..	..	..	1	.	..	..	107	5	112	..	..	..	..	..	..	....	5	107	112
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	..	..	..	..	1	..	..	121	4	125	..	..	..	..	..	..	....	4	121	125
..	..	..	..	..	.	..	..	..	..	..	..	..	..	..	1	2	..	..	..	1	2	..	..	142	6	148	..	..	..	1	1	1	2	7	143	150
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	2	1	..	..	87	5	92	..	..	..	1	4	1	5	6	91	97
..	..	..	..	..	..	1	..	..	..	2	..	..	..	1	1	3	..	1	1	8	2	..	..	416	20	436	..	..	1	3	..	4	4	24	416	440
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	1	..	..	59	3	62	..	..	..	1	..	1	1	4	59	63
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	40	1	41	..	..	.	..	..	..	....	1	40	41
..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	3	..	..	1	2	3	..	..	212	10	222	..	..	..	1	2	1	2	11	214	225
..	..	..	..	..	..	1	..	..	..	1	.	..	..	..	1	7	..	..	..	10	7	1	..	657	28	685	..	..	1	2	..	3	3	31	657	688
..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	5	..	1	1	6	5	1	..	564	21	585	..	1	1	1	3	3	6	24	567	591
..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	3	..	..	..	4	4	..	..	259	13	272	..	..	..	..	4	..	4	13	263	276
..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	3	..	..	..	4	6	..	..	483	15	498	..	..	..	1	4	1	5	16	487	503
1	..	1	..	1	.	5	..	..	1	9	..	2	1	4	6	40	1	3	4	41	37	3	..	3498	160	3658	..	2	4	12	23	18	41	178	3521	3699

since assigned to the district of the Platte; *eight* of the 1st cavalry and *two* of the 2d artillery have been retinued their march for Utah; and, finally, the detachment of engineers and the *six* companies of the 6th in-

S. COOPER,
Adjutant General.

J.—Position and distribution of the troops in the Department of the Pacific, commanded by Bvt. Brig.

POSTS.	SITUATION.	COMMANDING OFFICERS.	GARRISONS. Number of companies.	GARRISONS. REGIMENTS.
				Department staff...
Escort to Northwestern Bound'y Commission.	On Semi-ah-mo bay, Washington Territory.	Capt. D. Woodruff, 9th inf...	1	9th infantry.....
Fort Bellingham.....	On Bellingham bay, 16 miles south of the mouth of Frazer river, Wash. Ter.	1st Lt. J. C. Howard, 9th infantry.	1	9th infantry.....
Port Townshend	2½ miles from Port Townshend, on Admiralty inlet, Wash. Ter.	Capt. and Bvt. Major G. O. Haller, 4th infantry.	1	4th infantry.... ....
Fort Steilacoom.....	At the southern extremity of Puget's Sound, Wash. Ter.	Lt. Col. S. Casey, 9th infantry.	3	4th and 9th infantry
Fort Simcoe.....	65 miles north of Fort Dalles, in the Simcoe Valley, Yakima country, Wash. Ter.	Major R. S. Garnett, 9th inf..	3	9th infantry.....
Fort Walla-Walla ..	On Mill creek, 6 miles from its junction with the Walla-Walla river, Wash. Ter.	Major and Bvt. Lt. Col. E. J. Steptoe, 9th infantry.	6	1st dragoons and 9th infantry.
Fort Vancouver.....	On the Columbia river, 80 miles from its mouth, Wash. Ter.	Lt. Col. T. Morris, 4th inf...	1	4th infantry.....
Fort Cascades	Cascades of the Columbia, Washington Territory.	2d Lt. F. Mallory, 4th inf ...	1	4th infantry.....
Fort Dalles	Dalles of Columbia, Oregon Ter..	Col G. Wright, 9th infantry.	2	9th infantry.....
En route for Fort Walla-Walla.	Near Fort Dalles, Oregon Ter...	Capt. E. D. Keyes, 3d art'y..	4	3d artillery.....
Fort Yamhill	On the south fork of Yamhill river, 25 miles southwest of Dayton, Oregon Ter.	Capt. D. A. Russell, 4th infantry.	1	4th infantry.....
Fort Hoskins	On the Siletz river, 40 miles N.W. of Corvallis, Oregon Ter.	Capt. C. C. Augur, 4th inf....	1	4th infantry.....
Fort Umpqua.....	On the Umpqua river, near its mouth, Oregon Ter.	Maj. J. B. Scott, 3d artillery.	1	3d artillery .....
En route for Ft. Vancouver.	On Grave creek, Oregon Ter....	Capt. H. M. Judah, 4th inf...	1	4th infantry.....
En route for Ft. Vancouver.	Near Crescent City, California ..	1st Lieut. G. Crook, 4th inf...	1	4th infantry.....
En route for Fort Walla-Walla.	On steamship "Panama," off Crescent City, Cal.	Capt. and Brevet Maj. F. O. Wyse, 3d artillery.	2	3d artillery .....
En route for Fort Humboldt.	.....	1st Lieut. J. B. Collins, 4th infantry.	1	4th infantry.....
Fort Humboldt.....	Humboldt bay, California.....	Major G. J. Rains, 4th inf....	..	Detachment of 4th infantry.
Fort Crook	On Fall river, 7 miles north of Pitt river ferry, Cal.	Capt. J. W. T. Gardiner, 1st dragoons.	1	1st dragoons.....
Benicia barracks....	Benicia, California	Lt. Col. C. S. Merchant, 3d artillery.	..	Detachment of 3d artillery.
Presidio, San Francisco.	Near San Francisco, California..	1st Lieut. and Bvt. Capt. J. H. Lendrum, 3d artillery.	..	Detachment .....
Fort Tejon	Near Tejon Pass, at the head of San Joaquin valley, Cal.	Maj. G. A. H. Blake, 1st drag.	1	1st dragoons .....
En route for Fort Tejon.	Near Los Angeles, California ...	Capt. J. W. Davidson, 1st dragoons.	2	1st dragoons .....
Fort Yuma	At the junction of the Gila and Colorado rivers, California.	Maj. and Bvt Lieut. Col. G. Nauman, 3d artillery.	3	3d artillery .....
Aggregate of	the department.....	....	38	....

The force in this department has since been increased from *thirty-eight* to *forty-eight* companies, by the ad-
departments, known, respectively, as those of "California" and "Oregon."

ADJUTANT GENERAL'S OFFICE, *Washington, November* 30, 1858.

Gen. Newman S. Clarke, colonel 6th infantry.—Headquarters San Francisco, Cal., June 30, 1858

PRESENT.																													ABSENT.						PRESENT AND ABSENT.		
Brigadier generals.	Asst. adjutants general, (majors by bvt.)	Asst. adjutants general, (captains by bvt.)	Assistant quartermasters general	Deputy quartermasters general.	Quartermasters.	Assistant quartermasters.	Commissaries of subsistence, (majors.)	Commissaries of subsistence, (captains.)	Surgeons	Assistant surgeons.	Deputy paymasters general.	Paymasters.	Colonels.	Lieutenant colonels.	Majors	Captains	Aids de camp	Adjutants.	Regimental quartermasters.	First lieutenants.	Second lieutenants.	Brevet second lieutenants.	Military storekeepers.	Enlisted men.	Total commissioned.	Aggregate.	General and staff officers.	Field and regimental staff officers.	Captains.	Subalterns.	Enlisted men.	Total commissioned.	Aggregate.	Commissioned officers.	Enlisted men.	Aggregate.
..	1	..	..	1	..	..	1	..	1	..	..	5	1	..	..	..	1	..	..	1	1	..	1	3	14	17	..	..	..	..	.	..	....	14	3	17
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	76	2	78	..	..	..	1	..	1	1	3	76	79
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	1	..	..	75	3	78	..	..	1	..	..	1	1	4	75	79
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	52	2	54	..	..	..	1	..	1	1	3	52	55
..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	1	2	..	..	187	6	193	..	..	2	..	1	2	3	8	188	196
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	3	..	..	..	..	2	..	..	231	7	238	..	..	.	2	3	2	5	9	234	243
.	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	3	..	..	..	2	3	..	..	426	10	436	1	..	3	5	..	9	9	19	426	445
..	..	..	..	..	..	1	..	..	1	..	..	..	..	1	..	..	..	1	1	..	1	..	..	74	6	80	..	..	1	..	..	1	1	7	74	81
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	68	1	69	..	..	1	1		2	2	3	68	71
..	..	..	..	..	..	1	..	..	..	1	..	..	1	..	..	2	..	1	..	..	2	..	..	154	8	162	..	..	..	2	1	2	3	10	155	165
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	4	4	..	..	..	266	9	275	..	..	3	2	29	5	34	14	295	309
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	1	..	..	71	3	74	..	..	..	1	..	1	1	4	71	75
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	1	..	..	86	3	89	..	..				..	....	3	86	89
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	1	1	..	..	68	4	72	..	..	1	1	2	2	4	6	70	76
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	1	..	..	74	3	77	..	..	.	1	2	1	3	4	76	80
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	79	1	80	..	..	1		..	1	1	2	79	81
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	1	..	..	139	5	144	..	..		2	10	2	12	7	149	156
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	30	1	31	..	..	1	..	..	1	1	2	30	32
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	2	..	..	7	4	11	..	..	..	..	..	..	....	4	7	11
.	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	1	..	..	..	68	3	71	..	..	..	1	..	1	1	4	68	72
..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	1	1	..	..	..	..	26	4	30	..	..	..	..	..	..	....	4	26	30
..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	1	..	..	..	37	3	40	..	..	..	..	..	..	....	3	37	40
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	1	1	..	1	..	..	71	5	76	..	1	1	..	..	2	2	7	71	78
..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	[illegible]	..	..	114	3	117	..	..	1	1	10	2	12	5	124	129
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	2	..	..	..	..	2	..	..	217	8	22[illegible]	..	..	.	2	22	4	26	12	239	251
..	1	..	..	1	..	3	1	..	2	16	..	5	2	3	6	21	1	4	3	17	41	..	1	69[illegible]	118	281	1	1	1	1	30	3	123	161	279	29[illegible]

dition of the 5th regiment of infantry from Utah. And the department itself has been subdivided into two new

S. COOPER, *Adjutant General.*

K.

ADJUTANT GENERAL'S OFFICE,
Washington, November 30, 1858.

Statement showing the whole number of recruits enlisted in the army, from July 1, 1857, to June 30, 1858:

I. GENERAL RECRUITING SERVICE.

Major Albemarle Cady, 6th infantry, general superintendent.

Boston, Mass	294	
New Haven, Conn	172	
New York, N. Y	1,317	
Albany, N. Y	238	
Rochester, N. Y	249	
Syracuse, N. Y	1	
Buffalo, N. Y	229	
Trenton, N. J	69	
Philadelphia, Pa	679	
Pittsburg, Pa	125	
Baltimore, Md	96	
Newport, Ky	177	
Louisville, Ky	103	
Columbus, Ohio	6	
Detroit, Mich	172	
Chicago, Ill	450	
St. Louis, Mo	418	
Number of recruits enlisted for the general service		4,795

II. DEPARTMENT OF THE PACIFIC.

San Francisco, Cal		204

III. MOUNTED SERVICE.

Lt. Col. G. B. Crittenden, mounted riflemen, superintendent.

Boston, Mass	493	
New York, N. Y	578	
Albany, N. Y	290	
Buffalo, N. Y	89	
Philadelphia, Pa	240	
Pittsburg, Pa	21	
Carlisle, Pa	96	
Baltimore, Md	130	
Cumberland, Md	9	
Richmond, Va	73	
St. Louis, Mo	89	
New Orleans, La	88	
Washington, D. C	70	
Number of recruits enlisted for mounted service		2,266

IV. REGIMENTAL SERVICE.

First regiment of dragoons	96	
Second regiment of dragoons	48	
First regiment of cavalry	39	
Second regiment of cavalry	29	
Regiment of mounted riflemen	5	
Total mounted troops		217
First regiment of artillery	70	
Second regiment of artillery	164	
Third regiment of artillery	72	
Fourth regiment of artillery	83	
Total artillery		389
First regiment of infantry	8	
Second regiment of infantry	20	
Third regiment of infantry	29	
Fourth regiment of infantry	17	
Fifth regiment of infantry	21	
Sixth regiment of infantry	33	
Seventh regiment of infantry	55	
Eighth regiment of infantry	37	
Ninth regiment of infantry	3	
Tenth regiment of infantry	13	
Total infantry		236
Corps of sappers and miners		38
Detachment at West Point		59
Total number enlisted, from July 1, 1857, to June 30, 1858,		8,204

V. RECAPITULATION.

For the general service	4,795	
Department of the Pacific	204	
For mounted service	2,266	
By regiments.—Dragoons, cavalry, and mounted riflemen	217	
Artillery	389	
Infantry	236	
Sappers and miners and detachment at West Point	97	
Total		8,204

VI. AMOUNT OF RECRUITING FUNDS

In the hands of officers of the army, June 30, 1857.....	$35,283 61
Amount of recruiting funds advanced to recruiting officers, from July 1, 1857, to June 30, 1858.....	109,585 00
	144,868 61
Amount of funds accounted for from July 1, 1857, to June 30, 1858.....	112,992 41
Balance in the hands of recruiting officers, June 30, 1858	31,876 20

Remarks.—The three depots for recruits have been recently inspected, as also some of the principal rendezvous. The depots are at Fort Columbus, New York harbor, Carlisle barracks, Pennsylvania, and Newport barracks, Kentucky. An admirable system and effective state of discipline is visible at all these stations, which insure a degree of comfort highly necessary in giving first impressions of the service to recruits, and at the same time advance them in their military training as far as the duration of their stay at the depot will admit. The recruiting service, as now conducted, requires but little modification to make the system complete, and fully equal to supply all the ordinary casualties of the service.

The following is the number of officers employed on the general and mounted service:

General service.

1 major, superintendent, and commanding principal depot.
1 major, commanding depot at Newport barracks, Kentucky.
2 captains, on duty at depots and rendezvous.
16 subalterns, on duty at depots and rendezvous.

Mounted service.

1 lieutenant colonel, superintendent, and commanding depot.
7 subalterns, on duty at depot and rendezvous.

Respectfully submitted,

S. COOPER,
Adjutant General.

Hon. JOHN B. FLOYD,
Secretary of War, Washington, D. C.

XVII.

WASHINGTON, *November* 16, 1858.

SIR: Herewith I have the honor, on behalf of the commissioners of the Military Asylum, to submit the annual report of the treasurer of that institution, exhibiting its present financial condition.

Besides the completion of the apparatus for heating the asylum buildings since November last, a few additional improvements have been initiated with a view to the health and comfort of the inmates. Of these there are now, including the recent accessions from Harrodsburg, and exclusive of ten outside pensioners, one hundred and twenty-five.

The changes at Harrodsburg having been made, in pursuance of law, under the direction of the War Department, need not here be adverted to.

Colonel Payne having resigned his place as governor of the asylum in the District of Columbia, and Major Haskin, the late deputy governor, being with his regiment, the only officers now on asylum duty are Major T. L. Alexander, deputy governor, and Assistant Surgeon Benjamin King, treasurer of the board and secretary and treasurer at the asylum.

The board regret that they found it necessary for the good of the institution to dismiss several of the inmates during the past season on account of insubordinate and disorderly conduct. Those who remain, with perhaps a very few exceptions, appear contented, and to appreciate the provision made for them by government.

Some amendments are considered desirable in the law creating the asylum, which the commissioners propose at an early day to submit for the consideration of the department.

Respectfully submitted,

TH. S. JESUP,
Quartermaster General, President pro tem.

Hon. JOHN B. FLOYD,
Secretary of War.

Statement of receipts and expenditures on account of the United States Military Asylum funds, by Assistant Surgeon Benjamin King, United States army, treasurer, for the fiscal year ending June 30, 1858.

Remaining in the hands of the treasurer on June 30, 1857	$7,460 27
Received for the deductions of 25 cents per man per month from enlisted men of the army	54,143 78
Received for stoppages and fines by sentence of courts martial	31,473 60
Received for forfeitures on account of desertion from the army	24,416 11
Received for interest on $200,000 coupon bonds of State of Virginia	11,400 00
Received for interest on $20,000 coupon bonds of State of Missouri	600 00
Received for pensions of inmates of military asylum while remaining in and receiving the benefits of the asylum	2,197 91
Received from the post fund at military station	25

Paid for $20,000 of 6 per cent. coupon bonds of the State of Virginia	$14,380 00
Paid for $70,000 of 6 per cent. coupon bonds of the State of Missouri	57,389 14
Paid for the support of site of military asylum in the District of Columbia, including clothing, subsistence, fuel, medical and hospital supplies, bedding, furniture, commutation of rations to governor and acting governors, pay of farmer and farm hands, stewards, matron, cooks, baker, nurses and laundresses, inmates employed, monthly allowance to inmates, purchases of materials, repairs, building of fences, and all contingencies, &c	22,640 20
Paid for the support of site of military asylum at Harrodsburg, Ky., including clothing, subsistence, fuel, hire of surgeon, medical and hospital supplies, commutation of rations to acting governor, pay of steward, matron, and hired persons, cooks, baker, inmates employed, and monthly allowance to inmates, and for all contingencies, &c	4,365 00
Paid as pensions to members of military asylum while living with their families	805 80
Paid for erecting gas apparatus at the military asylum in the District of Columbia	5,600 00
Paid to deputy governor military asylum for the purchase of furniture for his house at site in District of Columbia	700 00
Paid to secretary to board of commissioners military asylum	730 00
Paid to treasurer military asylum funds, (services in May, 1857)	24 00
Paid for erecting and completing hot water apparatus for heating and warming main building military asylum	7,670 39
Paid for furnishing and laying iron pipes, with a force pump, to convey water to military asylum	1,399 30
Paid for furnishing and putting up iron railing around the piazzas and area walls of main building military asylum in District of Columbia	6,17575

		Paid for furnishing materials and erecting brick work of privy and building coal vaults at military asylum	1,000 00
		Paid for digging and walling wells and cistern, &c., and furnishing and putting in pumps	409 62
		Paid for advertising, for commissions and other expenses attending sale of military asylum, lands, and buildings, at Harrodsburg, Ky	841 66
		Refunded to heirs of deceased soldiers	44 05
		Paid for transportation of inmates to military asylum, &c	331 60
		Paid for transportation of officers of military asylum while travelling on asylum duty	134 00
		Paid for preparing deed and examining title to land purchased by military asylum	50 00
		Paid to messenger to board of commissioners military asylum	130 00
		Paid for printing done for military asylum	41 50
		Paid for fuel, stationery, &c., for office of treasurer military asylum	34 35
		Paid for iron fire-proof safe for office of treasurer military asylum	189 00
		Paid for cooking range, bells, &c., in officers' houses military asylum	188 25
		Paid for placing gas pipes, &c., in houses at military asylum	440 37
		Balance in hands of treasurer June 30, 1858	5,977 94
	131,691 92		131,691 92

N B. There also remained in the hands of the treasurer on June 30, 1858, of 6 per cent. coupon bonds of the State of Virginia, $200,000, and of 6 per cent. coupon bonds of the State of Missouri, $70,000.

BENJAMIN KING, *Assistant Surgeon, Treasurer Military Asylum.*

XVIII.

Report of the Quartermaster General for the fiscal year ending June 30, 1858.

QUARTERMASTER GENERAL'S OFFICE,
Washington, November 13, 1858.

SIR: In obedience to your order dated the 1st instant, I have the honor to submit a report of the operations of the quartermaster's department of the army for the fiscal year ending on and including the 30th of June last.

At the date of my last report the balances in the hands of officers acting in the department in the preceding year amounted to		$578,466 12
To which is to be added—		
1st. Remittances, 1st quarter, 1858	$2,611,076 16	
Remittances, 2d quarter, 1858	1,743,280 16	
Remittances, 3d quarter, 1858	455,679 25	
Remittances, 4th quarter, 1858	4,975,967 73	
		9,786,003 30
2d. Proceeds of drafts drawn on this office prior to July 1, 1858, paid since that date		30,449 36
3d. Proceeds of sales of property, rent of buildings, &c		77,906 36
Total to be accounted for		10,472,825 14
From which is to be deducted—		
1st. Expenditures, viz: prior to the fiscal year, the accounts for which were not received in time for the last annual report	$826,226 69	
In the 1st quarter of the fiscal year	1,797,972 93	
In the 2d quarter of the fiscal year	1,911,545 44	
In the 3d quarter of the fiscal year	1,093,673 27	
In the 4th quarter of the fiscal year	3,713,436 07	
	9,342,854 40	
2d. Deposits to the credit of the treasurer, and cancelled drafts	68,421 93	
		9,411,276 33
Balance, June 30, 1858		1,061,548 81

Accounts are due from twenty-one officers for the last fiscal year, whose joint accountability amounts to $28,393 23. The officers from whom these accounts are due were, with two or three exceptions, at extreme frontier posts, or in the field, which is doubtless the cause of their accounts not having been received; the remainder is in the hands of one hundred and fifty-three officers at posts extending over our whole territory, and in the field, and is applicable to the payment of

claims which accrued within the year and remained unpaid at its close, and to the service of the present year.

The accounts due from disbursing officers at the close of the year ending June 30, 1857, and not received in time for my report of that year, but included in this, will be seen to exceed considerably the amount for which the officers were known to be accountable at the close of that year; this is ascertained to have arisen principally from disbursing officers at many of the outposts, and in the field, having drawn drafts on the principal quartermasters in their respective military departments within that year, the proceeds of which they credited to the United States and applied to the public service within the year, but which were not paid by the officers on whom they were drawn until within the present year.

Major Osborne Cross, who was reported in my last report as having failed to account for		$22,637 91
has since refunded	$21,440 00	
and has submitted accounts amounting to	957 87	
Making, together		22,397 87
Leaving to be accounted for		240 04

but he claims a balance of $84 96 due to him; on a re-examination of his accounts he may be found to be correct.

Captain L. Loeser has failed to account for $3,125 21, due by him since the close of the 3d quarter of 1856.

Lieutenant Garber has failed to account for $7,095 38, due since the 1st quarter of 1857; and Lieutenant Lazelle has failed to account for $1,232 09, which should have been turned over to his successor on the 1st of April, 1857; he was ordered to duty in the department again on the 10th of December, 1857, but did not take up this sum, nor has he accounted for it since. Lieutenant A. Merchant has failed to account for $953 54, due since the 2d quarter of 1857, which sum should have been turned over to his successor when he was relieved at Fort Monroe on the 8th day of June, 1857.

I recommend that measures be adopted to compel these gentlemen either to account for the sums respectively due or to pay over the amounts to the treasury.

The amounts paid during the year, including those for supplies purchased and services rendered in the preceding year and not included in the report for that year, were—

1. For regular supplies, viz:		
Fuel	$149,942 85	
Forage	1,319,697 83	
Straw	4,756 26	
Stationery	23,017 35	
Making a total of		$1,497,414 29

2. For incidental expenses of the army.		
Postages	$9,109 73	
Expenses of courts martial	6,805 75	
Expresses and escorts	32,166 28	
Burial expenses	421 15	
Guides, interpreters, and spies	52,294 87	
Clerks and agents	83,707 30	
Wagon and forage masters	7,546 50	
Laborers	161,837 66	
Soldiers on constant labor	132,958 76	
Hire of veterinary surgeons	789 51	
Office furniture	2,997 23	
Medicines for horses and other animals	5,834 23	
Forges, blacksmiths' and shoeing tools	7,621,01	
Horse-shoes, nails, iron, and steel	56,443 48	
Recovering stray horses	682 50	
Apprehending deserters	13,275 69	
Making a total of		$574,491 65
3. Dragoon horses		555,093 20
4. Barracks and quarters—for rents	111,299 03	
For constructions and repairs	554,125 09	
		665,424 12
5. Mileage or transportation of officers		105,477 19
6. Transportation—		
Of clothing	75,901 44	
Of ordnance	66,201 43	
Of subsistence	905,612 43	
Of troops and supplies	3,836,628 74	
		4,884,344 04
7. For materials for, and amount expended in the preparation of clothing, camp and garrison equipage		983,254 96
8. Special appropriations and expenditures for other departments, viz:		
For remounting four companies light artillery		5,565 87
For rebuilding Carlisle barracks		24,316 02
For Florida volunteers		38,464 95
For printing military tactics		252 57
For Mexican hostilities		2,680 00
For army contingencies		2,519 84
For recruiting service		566 24
For medical department		6,741 27
For ordnance department		6 19
Total		9,346,612 40
From which is to be deducted—		
Amount of ascertained errors in officers' accounts		3,758 00
Total expenditure		9,342,854 40

The various regular supplies, viz., fuel, forage, straw, and stationery, were promptly furnished to the officers, corps, and branches of service entitled to them. The cost of forage was greatly increased in consequence of the partial failure of the corn crop throughout the west and southwest in the last calendar year, and of the oat crop the present year.

Transportation was furnished during the year for all the supplies required for the army; for five thousand two hundred and sixty-nine recruits from the several depots to their companies or corps; and for the troops operating in the field, or moving from one post or section of the country to another, or acting as escorts to different branches of the civil service. The movements made by the army within the year are estimated to equal a march of twelve hundred and thirty-four miles each of thirteen regiments; or of sixteen thousand and forty-two miles for a single regiment. The space covered by the army, and within which troops and supplies are almost constantly being moved, includes twenty-eight degrees of latitude and fifty-seven degrees of longitude. The item of transportation of troops and supplies includes not only the transportation of troops and the supplies required on the march, but of ordnance, clothing, subsistence, and all other supplies moving with bodies of troops.

For barracks, quarters, storehouses and other public buildings for the accommodation of the troops and the preservation of the public stores, all was done which the limited means at the disposal of the department enabled it to do. The following sums were expended in the erection and repair of military buildings, viz:

At twenty-five posts in the department of the Pacific....	$221,011 43
At twenty-one posts in the department of the east.....	20,793 43
At four posts in Florida	3,270 35
At fourteen posts in the department of the west.....	148,701 12
At fifteen posts in Texas.....	36,004 49
At twelve posts in New Mexico.....	19,388 03
At two posts in Utah.....	4,832 40
Amounting altogether to.....	454,001 25
In addition to these sums, there was expended from a special appropriation, as heretofore stated, in rebuilding barracks at Carlisle which had been destroyed by fire.....	24,316 02

In the department of the west and that of the Pacific, the expenditures for the construction and repair of barracks, quarters, and other public buildings, are, from the nature of the service there, beyond the control of this department, or perhaps of any authority here. Where troops are required to be placed they must be covered, and the public stores must be protected. The appropriations and expenditures for those objects in the three years ending the 30th of June last will demonstrate the truth of my remarks.

The appropriation for the construction and repair of public buildings in the department of the west was, for the year ending the 30th of June, 1856 ..... $95,500 00
For the year ending June 30, 1857 ..... 100,000 00
For the year ending June 30, 1858 ..... 155,000 00

Amounting to 350,500 00

And the expenditures for those years were, for that ending June 30, 1856 ..... $266 987 97
For that ending June 30, 1857 ..... 178,493 01
For that ending June 30, 1858 ..... 148,701 12

Amounting in the three years to 594,182 10

being an excess of expenditure over the appropriations of $243,682 10, in addition to which considerable sums were paid to soldiers on extra duty at work on the several buildings; and in nearly all instances public means of transportation were used in the constructions and repairs made.

The appropriations for those objects made for the department of the Pacific were—

For the year ending June 30, 1856 ..... $82,800 00
For the year ending June 30, 1857 ..... 135,000 00
For the year ending June 30, 1858 ..... 130,000 00

Amounting to 347,800 00

And the expenditures for those years were—
In the year ending June 30, 1856 ..... $253,240 87
In the year ending June 30, 1857 ..... 218,935 32
In the year ending June 30, 1858 ..... 221,011 43

Amounting to 693,187 62

being an excess of expenditures in that department over the appropriations for the three years of $345,387 62.

The posts in the department of the Pacific are said to be generally well selected; the same cannot be said, however, in regard to some of those in the department of the west. In a country without the resources developed by an active and industrious population, there are three important elements which should govern in the establishment of a military post. They are, first, an abundant supply of pure water; second, wood for fuel and for building; and, third, grass for the support of the public animals in summer, and the supply of hay for them in the winter. If either be wanting, not a cent should be expended on any interior site, no matter what its supposed military advantages in other respects may be.

Clothing, camp and garrison equipage, were provided and furnished to the troops throughout our Territories in the quantities in which they were due. The cost of the clothing for the troops is increased by the recent change in the uniform about seventy-nine thousand dol-

lars per annum, and that of the equipage, by the adoption of the Sibley tent, a copy of the old Sioux lodge, about five dollars a tent; but this tent affords more comfort and contributes more to the preservation of the health of the men than that before in use. The cost of equipage is also increased by the adoption of the iron bedstead, which is preferred by the troops because it is more easily kept clean than the wooden bunk formerly in use.

The expenditures during the year have been extremely heavy, as will be seen by reference to the preceding pages of this report, but the objects accomplished have been even beyond the expenditures.

The movement of the army to Utah is without a parallel in military history. The advance of that army spent last winter in the Rocky mountains, eleven hundred miles from its depot, in comparative comfort, and the main body moved forward in seven separate columns between the 8th of May and the 15th of June; the last column arrived at Camp Floyd, in Utah, on the 25th of September; and by the last reports the rear trains with clothing, quartermasters' stores, and subsistence, were reported so near that they would arrive from the 5th to the 15th of October.

The expenditures on account of the expedition to Utah, as far as ascertained, exceed five millions of dollars. Besides the vast supplies provided for the service, the operating columns were furnished with nine travelling forges, twenty-two ambulances, twenty-nine light wagons, nine hundred and eighty-eight baggage wagons, six thousand four hundred and forty-seven mules, and two hundred and fifty-four horses, in addition to the horses furnished for the mounted corps. And for the transportation of supplies for the army, and for the depots at Fort Kearney and Fort Laramie, on the route, three thousand nine hundred and eight wagons, thirty-three mules, and forty-six thousand eight hundred and ninety-six oxen, were required; being four thousand nine hundred and fifty-six wagons and carriages, and fifty-three thousand four hundred and thirty draught animals.

For the operations in Texas, New Mexico, Washington, and Oregon, everything depending upon this department was furnished promptly; but I have not the data to make a report of the means of transportation required by the different armies or detachments.

In organizing the material and providing the means for the movement of the army of Utah, with its vast supplies, the energies of this department were taxed to the utmost; and for the successful results which have crowned all the measures necessary for the movement and supply of the army much is due to the energy, intelligence, and untiring zeal of Colonel Charles Thomas and Colonel Daniel D. Tompkins, assistant quartermasters general; Lieutenant Colonel George H. Crosman, deputy quartermaster general; to the late Captain Thomas L. Brent, and to Captain S. Van Vliet, Captain W. S. Hancock, and Captain J. H. Dickerson, assistant quartermasters. Other officers of the department performed valuable services, but had not the opportunity of doing as much as those named.

A more successful campaign than that directed by General Clark and carried out by Colonel Wright and Major Garnett, against the hostile tribes of Indians in Oregon and Washington Territories, has

never before been witnessed in the whole course of our history. The measures required to put the troops into the field, and to supply them on the extensive theatre covered by their operations, were promptly adopted and ably carried out by Lieutenant Colonel Swords, deputy quartermaster general, aided by Major Allen, Captain Jordan, Captain Ingalls, and Captain Kirkham, assistant quartermasters. Great credit is due to all these officers for the energy and zeal which they have displayed.

The estimate presented for the next fiscal year, though in some of its items larger than that for the present year, will be seen to be below the expenditures made last year. If the Mormon difficulties are really over and the Indian war in Oregon and Washington Territories at an end, it may not all be required, unless an expensive Indian war, which is now threatened, should take place in New Mexico. In that event, the whole, perhaps more, will be required.

It is bad economy to cut down estimates. If the appropriations be more than required for the service, the portions not wanted will remain in the treasury; but if they be less, and supplies be necessarily purchased on credit, higher prices will be always charged in proportion to the uncertainty of the time of payment. I am very sure that if we had had the money for the Utah service on the first of January, which we did not receive until May, from two to three hundred thousand dollars, perhaps more, would have been saved in the three items of horses, mules, and grain.

By reference to the details of the expenditures in the last fiscal year it will be seen that the item for transportation is more than one-half of the whole sum; this will continue until some better mode of transportation be adopted and carried out by the authority of Congress, (railroads would be the best,) or until the whole country over which our military movements extend be cultivated, and the supplies required for the troops be obtained in the vicinity of their operations.

In regard to the great advantage by railroad transportation over any other mode of land transportation, I have had occasion recently to make investigations, the results of which I beg to submit. The average military force in service during the five years ending the 31st of December last, was about thirteen thousand six hundred, rank and file; and the cost of the whole transportation for that force exceeded ten millions of dollars, or more than two millions a year. The average force in service for the five years prior to the annexation of Texas was over nine thousand nine hundred, rank and file; and the cost of its transportation during that whole period was a little over seven hundred and eighty thousand dollars, or one hundred and fifty-six thousand dollars a year. Had prices and circumstances remained the same, the transportation of the increased force would have been, for the five years, about a million and ninety thousand dollars, or only two hundred and eighteen thousand dollars a year; making a difference in that item alone of eight million nine hundred and ten thousand dollars. The increase in prices would probably have caused an increase of expenditure to something more than two millions of dollars; thus making an increase of expenditure in five years for transportation, caused by the extent and want of resources of our new

Territories, and the difficulty of communicating to and within them, of nearly eight millions of dollars.

In my last annual report I took occasion to mention the necessity for additional clerks in this office. In addition to those now authorized by law, four efficient clerks are required; but if not efficient I would rather not have them. For some years past Congress has appropriated five thousand dollars a year for the payment of temporary clerks employed in examining bounty-land claims, the evidence of which is filed in this office. I at first employed four clerks, but on the 1st of May, 1857, I was obliged to employ an additional clerk, and consequently to reduce the pay of all to a thousand dollars each. I respectfully ask that they be placed upon an equality with the junior clerks in other public offices here from the time their compensation was reduced.

The business of this office has increased so much in consequence of the great extension of our Territories, that the four additional clerks which I ask are necessary to bring up the regular business of the office and keep it up in the manner it should be kept up. Should these additional clerks be allowed, the appropriation for extra clerks might be reduced after the next fiscal year to a sum sufficient for the employment of two.

I had intended to accompany this report with a general return of the property in use and in store in the army, but could not obtain the materials in time; but it is being prepared, and I hope to be able to present it to you before the meeting of Congress.

With high consideration and respect, I have the honor to be, sir, your obedient servant,

TH. S. JESUP,
Quartermaster General.

Hon. JOHN B. FLOYD,
Secretary of War, Washington City.

XIX.

OFFICE COMMISSARY GENERAL OF SUBSISTENCE,
Washington, October 25, 1858.

SIR: I have the honor to submit the following report of the operations of this department during the fiscal year ending June 30, 1858, and to transmit an estimate for the subsistence of the army for the fiscal year ending June 30, 1860.

The principal part of the subsistence stores procured for the army during the past fiscal year was obtained in the cities of New York, Norfolk, Charleston, New Orleans, St. Louis, and San Francisco; the officers of the department at these points advertising for bids when the stores were required, and accepting the lowest bids for suitable articles.

Flour for the troops in New Mexico was procured by contract from wheat grown in that Territory or the adjacent provinces of Mexico, and such other articles of the ration as were the products of that Territory were there purchased to save the expense of transportation.

Fresh beef for the troops at the Atlantic posts in Florida and Texas and on the Pacific coast was procured by contract from the vicinity of the posts. In New Mexico, at Forts Riley, Ripley, Randall, and Ridgely, cattle on the hoof were procured, grazed, and fed by the department.

Every effort was made to supply the troops with abundance of good and wholesome food and with complete success, except those at Fort Bridger. Ample preparations for their subsistence, it was believed, were made in the spring of 1857, but the hostile acts of the Mormons in running off the contractor's cattle, and in destroying the trains containing nearly all the salt meats, with other subsistence stores, left but a scanty supply for these troops during the winter and spring. As early as the grass would permit cattle and other subsistence stores were forwarded to them from Fort Laramie.

During last spring one year's supply of subsistence stores for the troops under orders for and in Utah was purchased in St. Louis, and two contracts were made for cattle: one for unworked steers for immediate use, to be delivered at Forts Kearney, Laramie, and in Utah; the other for draught cattle, to be delivered when in fine condition in Utah.

These stores were fairly under way to Utah when, in consequence of the favorable news received, part of the troops *en route* were diverted from their course and directed to other objects. Such stores as were required for those troops until their return to Fort Leavenworth and one year's supply for the posts on the plain were taken from the Utah trains; the remainder continued on to Utah, thus securing there a partial supply for another year.

The contractors for the unworked steers withdrawing from their contract before giving bonds, an officer of the department was sent to purchase cattle at Fort Leavenworth, from whence they were driven to the posts named and to Utah, at the expense of the department.

The "desiccated vegetables" of Chollet & Co., wherever used in the army, have given great satisfaction, and it is respectfully recommended that desiccated "potatoes" and "mixed vegetables" be introduced generally into the army as a part of the ration and be issued twice per week in lieu of beans or rice.

The officers acting in this department have generally rendered their accounts as promptly as the nature of their service would permit, and have generally performed their duties with zeal and fidelity.

It will be seen that in the estimate herewith submitted the cost of the ration is estimated at twenty-five cents, that of the previous estimate having been twenty-six and one-half cents.

Most respectfully, your obedient servant,

J. F. TAYLOR,
Acting Commissary General of Subsistence.

Hon. JOHN B. FLOYD,
Secretary of War.

XX.

PAYMASTER GENERAL'S OFFICE,
November 10, 1858.

SIR: I have the honor to submit herewith a report of the transactions of the pay department of the army during the fiscal year ending June 30, 1858.

It is shown by the tabular statement herewith that there remained in the hands of paymasters, on June 30, 1857, applicable to payments in the first quarter of the last fiscal year, the sum of... $390,578 76

In addition to which they have received from the treasury and other sources, exclusive of amounts transferred from one to another or repaid into the treasury, the sum of..... 4,758,988 05

Making a total to be accounted for of.. ..... 5,149,566 81

Expended as follows:

Payments to regular troops.....	$4,393,446 32	
Payments to volunteers.....	54,472 74	
Payments to the Military Academy...	99,890 31	
		4,547,809 37
Leaving a balance to be accounted for of.....		601,757 44

This balance it is believed has, in most cases, been expended and accounted for since the commencement of the present fiscal year.

The troops in every part of the country have been satisfactorily paid except in a few instances, growing out of causes beyond the control of the department.

I beg leave respectfully to call your attention again to the memorial of paymasters' clerks, presented to Congress at its last session, asking that their salaries be increased to $1,000 per annum. This would only place them upon an equality with the clerks of the lowest class employed in the departments. Paymasters are compelled to travel with funds over wide districts of country, frequently in the vicinity of hostile Indians, and it is of the greatest importance they should be able to secure the services of reliable persons of the highest integrity, as well as capacity.

I have the honor to be, very respectfully, your obedient servant,

BENJ. F. LARNED,
Paymaster General.

Hon. JOHN B. FLOYD,
Secretary of War.

Statement showing the amount remaining in the hands of each of the disbursing officers of the Pay Department, and unaccounted for, on the 1st of July, 1857, the amount remitted to each from the treasury, or turned over by other agents, during the fiscal year ending June 30, 1858; the amount accounted for by accounts and vouchers of expenditure, or by transfer or replacement in the treasury; and the balance unaccounted for to be applied to payments in the first quarter of the next fiscal year.

Paymasters.	Balances in the hands of paymasters, and unaccounted for on July 1, 1857.	Remitted from treasury and turned over by other agents, in year ending June 30, 1858.	Total am'nt received and to be accounted for.	Amount expended in paying the regular troops.	Amount expended in paying volunteers.	Amount expended in paying the military academy.	Amount turned over to other agents, or replaced in the treasury.	Total amount accounted for.	Balances unexpended, to be applied to payments in the next fiscal year.
T. P. Andrews, deputy paymaster general	.....	$295,170 42	$295,170 42	$267,000 74	$4,729 99	.....	$6,465 41	$278,196 14	$16,974 28
E. Van Ness.....do.....do	.....	188,145 98	188,145 98	160,450 61	.....	.....	8,050 00	168,500 61	19,615 37
T. J. Leslie	$1,705 95	434,301 91	436,007 86	376,590 64	1,251 18	.....	50,624 73	428,466 55	7,541 31
St. Clair Denny	35,134 47	584,631 67	619,766 14	152,044 19	759 40	.....	448,920 73	601,724 32	18,041 82
David Hunter	17,942 23	814,327 14	832,269 37	513,621 38	.....	.....	261,937 89	775,559 27	56,710 10
L. J. Beall	1,902 84	161,113 45	163,016 29	94,581 38	1,416 57	.....	29,966 42	125,964 37	37,051 92
A. J. Coffee	9,066 70	179,098 22	188,164 92	99,662 66	3,110 28	.....	32,000 00	134,772 94	53,391 98
G. H. Ringgold	7,621 42	112,647 67	120,269 09	100,762 12	.....	.....	10,000 00	100,762 12	9,506 97
Henry Hill	2 43	481,337 54	481,339 97	326,922 57	331 72	$99,890 31	54,189 53	481,334 13	5 84
R. B. Reynolds	11,235 14	88,492 60	99,727 74	90,297 77	6,447 63	.....	.....	96,745 40	2,982 34
J. Y. Dashiell	43,228 55	27,045 10	70,273 65	28,072 92	.....	.....	23,115 00	51,187 92	19,085 73
S. Maclin	317 82	104,759 99	105,077 81	104,582 70	.....	.....	.....	104,582 70	495 11
A. W. Gaines	38,729 14	232,136 22	270,865 36	136,058 09	.....	.....	134,807 27	270,865 36	.....
Hiram Leonard	18,556 37	49,724 29	68,280 66	22,090 38	797 08	.....	38,755 58	61,643 04	6,637 62
F. A. Cunningham	704 08	108,610 25	109,314 33	108,253 51	.....	.....	150 00	108,403 51	910 82
George C. Hutter	9,824 83	100,908 96	110,733 79	98,128 86	94 00	.....	491 30	98,644 16	12,089 63
A. J. Smith	10,411 27	285,890 06	296,301 33	142,861 95	1,970 91	.....	131,287 33	276,120 19	20,181 14
N. W. Brown	.....	369,403 34	369,403 34	63,675 19	32,020 27	.....	155,883 85	251,579 31	117,824 03
B. W. Brice	1,112 40	186,061 66	187,174 06	179,889 65	.....	.....	7,284 41	187,174 06	.....
Cary H. Fry	28,931 02	148,519 99	177,451 01	166,995 36	.....	.....	1,262 13	168,257 49	9,193 52
Benjamin Alvord	24,173 13	170,582 25	194,755 38	157,911 04	221 18	.....	25,100 00	183,232 22	11,523 16
R. H. Chilton	9,310 11	213,570 30	222,880 41	162,635 33	107 32	.....	50,323 58	213,066 23	9,814 18
F. E. Hunt	104,572 06	361,387 73	465,959 79	398,352 10	.....	.....	50,245 00	448,597 10	17,362 69
Henry Prince	11,476 76	339,484 72	350,961 48	155,318 70	.....	.....	79,511 06	234,829 76	116,131 72
Samuel Woods	2,120 04	132,742 20	134,862 24	88,548 69	1,268 76	.....	19,672 23	109,489 68	25,372 56
A. B. Ragan	2,500 00	221,337 84	223,837 84	198,137 79	16 45	.....	12,400 00	210,554 24	13,283 60
	390,578 76	6,391,431 50	6,782,010 26	4,393,446 32	54,472 74	99,890 31	1,632,443 45	6,180,252 82	601,757 44

PAYMASTER GENERAL'S OFFICE, *November* 10, 1858.

BENJ. F. LARNED, *Paymaster General.*

XXI.

REPORT OF THE SURGEON GENERAL.

SURGEON GENERAL'S OFFICE,
November 8, 1858.

SIR: I have the honor to submit to you the usual financial report of the medical department of the army, together with a tabular statement of the sick and wounded of the army for the year ending on the 30th of June, 1858.

The amount of the regular appropriation for the medical and hospital department of the army which remained on the 30th of June, 1857, was—

In the hands of disbursing agents	$9,666 00		
In the treasury of the United States	65,477 25		
Amount appropriated per act approved March 3, 1857, for current expenses of the medical and hospital department for the year ending June 30, 1858	105,000 00		
Amount refunded into the treasury from losses	119 50		
Amount refunded into the treasury from auction sales of condemned property	237 38		$180,500 90
Of the foregoing sums there have been expended—			
On account of pay and other claims of private physicians contracted in 1847	275 58		
Do do 1848	678 98		
Do do 1849	27 00		
Do do 1850	590 00		
Do do 1851	41 00		
Do do 1852	22 50		
Do do 1853	106 61		
Do do 1854	157 50		
Do do 1855	267 00		
Do do 1856	2,301 79		
Do do 1857	9,469 40		
Do do 1858	11,248 52		
		$25,185 88	
On account of medical and hospital supplies, books, and nurses, &c. 1847	112 35		
Do do 1848	9 00		
Do do 1852	23 47		
Do do 1853	16 34		
Do do 1854	70 46		
Do do 1855	65 90		
Do do 1856	475 15		
Do do 1857	10,358 08		
Do do 1858	83,712 36		
		94,843 11	
Leaving in the hands of disbursing agents	5,388 11		
In the treasury of the United States	55,083 80		
		60,471 91	
			180,500 90

The foregoing statement shows that the total amount of funds available for the service of the medical and hospital department of the army during the fiscal year ending June 30, 1858, was one hun-

dred and eighty thousand five hundred dollars and ninety cents, ($180,500 90;) and that the expenditures amounted to one hundred and twenty thousand and twenty-eight dollars and ninety-nine cents, ($120,028 99;) leaving a balance of sixty thousand four hundred and seventy-one dollars and ninety-one cents, ($60,471 91,) of which sum the major part was then due for payments made by officers of the pay department to hospital cooks and nurses, the accounts for which had not been settled in this office.

Of the total sum expended during the fiscal year embraced in this report, twenty-five thousand one hundred and eighty-five dollars and eighty-three cents ($25,185 83) were paid on account of the pay and other claims of private physicians, and ninety-four thousand eight hundred and forty-three dollars and eleven cents ($94,843 11) for medical and hospital supplies, and for the pay of hospital cooks and nurses.

The subjoined statistical report of the sick and wounded of the army for the year commencing July 1, 1857, and ending June 30, 1858, compiled from the quarterly reports of the medical officers, exhibits the following results:

At the commencement of the year there were 846 officers and enlisted men remaining on sick report, of whom 424 were reported as sick, and 422 as convalescent; the number of cases of wounds and disease occurring during the year was 38,188; making an aggregate of 39,034 cases under treatment during the year. Of this aggregate 37,568 were returned to duty, 22 were placed on furlough, 296 were discharged from the service, 39 deserted, and 208 died; leaving 384 sick, and 517 convalescent; in all 901 under medical treatment.

As the mean strength of the army for the year ending June 30, 1858, according to returns made to this office, was 14,510, and the number of cases of disease reported in that time was 38,188, it results that the proportion of cases to the number of officers and enlisted men was 2.63 to one.

For the same period the ratio of deaths (208) to the mean strength of the army (14.510) was 1 to 69.76, or 1.43 per cent., and the proportion of deaths to the aggregate number of cases treated (39,034) was 1 to 187.61, or 0.53 per cent.

The meteorological observations continued as heretofore at the military stations are reported to this office in monthly registers, which are examined, and the general results recorded at once in books prepared for that purpose, so as to be ready for publication whenever required. It has become necessary to have those original registers bound in volumes, in order to preserve them from injury, and, also, to facilitate reference to them, as they are frequently consulted by officers of the Smithsonian Institution and other persons interested in meteorology.

Since my last annual report an army medical board for the examination of assistant surgeons for promotion, and candidates for appointment in the medical department of the army, was convened at Richmond, Virginia.

Forty-four candidates were invited by the War Department to appear before the board of examination, of whom twenty-seven reported

in person. Of the twenty-seven who thus reported, four withdrew voluntarily without an examination; seven withdrew at a more or less advanced period of their professional examination; six were fully examined, and of these last two were found qualified for appointment.

The board also examined two assistant surgeons for promotion, both of whom failing to come up to the required standard of merit, yet not exhibiting sufficient cause for absolute rejection, were placed on probation, to be re-examined after a limited period.

Of one hundred and seven medical officers, composing the entire medical staff of the army, there are at this time only one surgeon and three assistant surgeons incapacitated for duty by sickness, and two assistant surgeons on leave of absence, leaving one hundred and two medical officers on duty, almost all of whom are serving with troops on the frontiers or in the field.

All of which is respectfully submitted.

TH. LAWSON, *Surg. Genl.*

Hon. J. B. FLOYD,
Secretary of War.

Annual report of the sick and wounded of the army of the United States for the year ending June 30, 1858.

Quarters.	REMAINING LAST REPORT.			TAKEN SICK OR RECEIVED INTO HOSPITAL DURING THE YEAR.																					
				Fevers.									Eruptive fevers.						Diseases of the organs connected with the digestive system.							
	Sick.	Convalescent.	Total.	Febris continua communis.	Febris intermittens quotidiana.	Febris intermittens tertiana.	Febris intermittens quartana.	Febris remittens.	Febris typhus.	Febris typhus icterodes.	Febris typhoides.	Febris congestiva.	Erysipelas.	Rubeola.	Scarlatina.	Variola.	Varioloid.	Vaccinia.	Cholera morbus.	Colica.	Parotidis.	Diarrhœa acuta.	Dysenteria acuta.	Dysenteria chronica.	Dyspepsia.	Enteritis.
September 30, 1857..	.....	.....	.....	44	631	786	34	207	5	....	22	3	8	3	...	....	....	...	117	151	6	1,651	293	28	59	6
December 31, 1857..	.....	.....	.....	45	540	525	12	116	6	....	10	1	5	....	....	....	....	...	15	117	21	1,218	176	12	51	8
March 31, 1858.....	.....	.....	.....	46	233	368	24	73	1	2	10	....	16	12	4	6	2	1	6	94	14	833	116	68	46	2
June 30, 1858.....	.....	.....	.....	30	404	721	22	206	1	....	39	....	13	17	4	8	....	1	42	169	15	1,184	376	17	63	7
Grand total.....	494	422	846	165	1,808	2,400	92	602	13	2	81	4	42	32	8	14	2	2	180	531	56	4,886	961	125	219	23
Causes of death..	.....	.....	.....	4	.....	.....	.....	8	5	....	13	5	....	....	....	....	....	....	1	1	.....	3	6	7	1	2

Annual report of the sick and wounded of the army—Continued.

Quarters.	TAKEN SICK OR RECEIVED INTO HOSPITAL DURING THE YEAR.																															
	Diseases of the organs connected with the digestive system.										The respiratory system.											The brain and nervous system.										
	Gastritis.	Hematemesis.	Hepatitis acuta.	Hepatitis chronica.	Icterus.	Obstipatio.	Peritonitis.	Tonsilitis.	Diarrhœa chronica.	Cholera Asiatic.	Asthma.	Bronchitis acuta.	Bronchitis chronica.	Catarrhus.	Hæmoptysis.	Laryngitis.	Phthisis pulmonalis.	Pleuritis.	Pneumonia.	Catarrhus epidemic.	Tracheitis.	Apoplexia.	Cephalalgia.	Delirium tremens.	Epilepsia.	Mania.	Melancholia.	Meningitis.	Neuralgia.	Paralysis.	Tetanus.	Ictus solis.	All other diseases.
September 30, 1857..	18	1	5	5	10	397	1	80	22	....	9	79	4	505	8	1	12	22	23	109	....	1	111	47	10	9	....	....	35	2	...	15	...
December 31, 1857..	16	5	4	5	6	280	3	137	25	11	6	120	5	1,379	3	5	11	40	46	232	....	1	164	50	18	5	3	...	75	2	...	....	2
March 31, 1858.....	9	1	11	4	7	381	5	207	14	1	4	185	5	1,273	3	6	16	45	53	97	....	1	140	52	19	3	2	1	42	4	2	1	3
June 30, 1858.....	10	2	2	2	6	534	....	114	19	....	5	109	6	672	4	7	7	23	45	98	....	10	116	40	15	2	3	2	47	8	....	15	...
Grand total.....	53	9	22	16	29	1,592	9	538	80	12	24	493	20	3,829	18	19	46	130	167	536	...	13	531	189	62	19	8	3	199	16	2	31	5
Causes of death.	....	....	....	1	....	.....	1	.....	6	6	....	1	1	.....	1	....	18	5	21	.....	1	4	....	13	2	1	...	2	....	....	....	1	4

Annual report of the sick and wounded of the army—Continued.

Quarters.	TAKEN SICK OR RECEIVED INTO HOSPITAL DURING THE YEAR.																												
	The urinary and genital organs.														The serous exhalent vessels.					The fibrous and muscular structures.						Abscesses and ulcers.				
	Calculus.	Cystitis.	Diabetes.	Enuresis.	Gonorrhœa.	Ischuria et dysuria.	Nephritis.	Orchitis.	Stricture urethræ.	Syphilis primitiva.	Syphilis consecutiva.	Ulcus penis non syphiliticum.	Bubo syphiliticum.	All other diseases.	Anasarca.	Ascites.	Hydrocele.	Drowned.	Mania a potu.	Pernio.	Podagra.	Rheumatismus acutus.	Rheumatismus chronicus.	Lumbago.	Furunculus.	Fistula.	Phlegmon et abscessus.	Ulcus.	Anthrax.	Paronychia.
September 30, 1857..	2	4	....	5	227	9	4	22	2	116	67	4	17	29	2	....	1	...	....	1	2	260	154	12	55	2	408	162	9	66
December 31, 1857..	2	1	1	....	218	7	5	29	5	115	70	4	....	25	....	3	....	....	....	57	1	361	152	15	21	6	349	188	2	48
March 31, 1858. ...	....	1	....	4	309	2	8	44	7	123	72	5	....	34	4	1	...	...	....	56	3	414	131	17	57	3	424	127	...	33
June 30, 1858.....	...	4	....	4	272	9	2	39	17	139	80	6	28	....	5	....	2	..	....	4	....	344	159	20	66	6	381	149	6	37
Grand total.....	4	10		13	1,026	27	19	134	31	493	289	19	45	88	11	4	3	..	....	118	6	1,379	596	64	199	17	1,562	626	17	184
Causes of death.	....	...	....	....	.....	1	1	.....	....	.....	.....	....	....	1	1	1	....	3	2	2	....	1	1	.....	.....	....	.....	.....	....	....

Annual report of the sick and wounded of the army—Continued.

Quarters.	TAKEN SICK OR RECEIVED INTO HOSPITAL DURING THE YEAR.																															
	Wounds and injuries.														All other diseases.																	
	Ambustio.	Amputatio.	Concussio cerebri.	Contusio.	Fractura.	Luxatio.	Punitio.	Subluxatio.	Vulnus incisum.	Vulnus lacceratum et contus.	Vulnus punctum.	Vulnus sclopeticum.	Carditis.	Endocarditis.	Amaurosis.	Aneurisma.	Angina pectoris.	Unknown.	Cachexia.	Debilitas.	Ebrietas.	Exostosis.	Hæmorrhois.	Hemeralopia et nyctalopia.	Hernia.	Morbi cutis.	Morsus serpentis.	Necrosis.	Odontalgia.	Opthalmia.	Otitis.	Pericarditis.
September 30, 1857..	35	1	1	547	27	21	6	116	163	111	66	48	2	3	....	....	6	....	4	85	147	1	76	6	11	104	2	1	71	142	28	....
December 31, 1857..	36	....	2	624	32	13	9	151	185	146	40	34	1	7	1	....	1	....	....	55	173	1	79	2	14	95	....	....	113	170	39	5
March 31, 1858.....	36	2	4	634	29	24	7	191	162	180	35	22	2	9	1	1	....	....	1	50	162	....	49	9	13	106	1	2	123	156	49	2
June 30, 1858.....	33	1	4	594	20	14	16	176	125	171	56	34	....	9	2	....	....	....	1	78	156	6	75	9	14	81	1	1	110	149	37	3
Grand total.....	140	4	11	2,399	108	72	38	634	635	608	197	138	5	28	4	1	7	....	6	268	638	8	279	26	52	386	4	4	417	617	153	10
Causes of death.	....	....	2	.....	1	...	.. .	.....	1	.....	5	16	2	....	....	....	....	2	...	....	4	....	. ..	....	.....	.....	....	....	.....	....	....	....

Annual report of the sick and wounded of the army—Continued.

Quarters.	TAKEN SICK OR RECEIVED INTO HOSPITAL DURING THE YEAR.																					REMAINING.			MEAN STRENGTH.		
	All other diseases.																										
	Prolapsus ani.	Schirrus.	Scorbutus.	Scrofula.	Splenitis.	Suicidium.	Toxicum.	Varix and varicocela.	Vermes.	Nostalgia.	Disease of heart.	Anchylosis.	Gastro enteritis.	Morbi varii.	Total.	Aggregate.	Returned to duty.	On furlough.	Discharged service.	Deserted.	Dead.	Sick.	Convalescent.	Total.	Officers.	Enlisted men.	Total.
September 30, 1857..	1	1	102	7	4	....	23	12	8	4	2	....	....	454	9,686	.....	.....	7	69	14	53	.....	.....	.....	599	11,505	12,104
December 31, 1857..	3	...	49	6	3	3	3	3	7	....	....	2	....	432	9,761	.....	.....	4	49	10	59	.....	.....	.....	668	13,397	14,065
March 31, 1858.....	2	..	90	2	3	....	8	5	7	....	....	1	....	429	9,062	.....	.....	4	84	6	40	.....	.....	.....	690	14,733	15,423
June 30, 1858.....	1	....	69	3	....	1	34	9	12	....	....	1	....	532	9,679	.....	.....	7	94	9	56	.....	.....	.....	692	15,756	16,448
Grand total.....	7	1	310	18	10	4	68	29	34	4	2	4	....	1,847	38,188	39,034	37,568	22	296	39	208	384	517	901	Aggregate.....		58,040
Causes of death.	....	....	2	....	....	4	....	....	....	...	2	....	2	6	208	.....	.....	....	....	....	208	.....	.....	.....	Average.....		14,510

THOS. LAWSON, *Surgeon General.*

XXII.

REPORTS FROM THE ENGINEER DEPARTMENT.

ENGINEER BUREAU,
Washington, November 22, 1858.

SIR: Under your instructions I have the honor to submit the following report of the progress and condition of the fortifications of the country for the year ending on the 30th June, 1858.

In the special reports which follow, the progress made on the respective works during the year, and their condition at its close are stated. On the works which had already been commenced and more or less advanced towards completion this progress has been as great as the amounts available and a judicious application of the funds permitted; while on the new works little has generally been done in the way of commencement of construction, and in some cases nothing, owing to the necessity for restricting the general expenditures as much as possible, on account of the condition of the treasury.

The amounts named in connexion with the special reports are the specific sums introduced, under your instructions, into the estimates for fortifications for the fiscal year ending June 30, 1860. They will in some cases serve for a moderate progress, while in others they will only provide for the care of the works and the preservation of the property thereat during the year's suspension of operations.

Fort Wayne, Detroit, Michigan, in charge of Lieutenant C. E. Blunt.—The decay of the timber revetments of this work still continues. Three hundred and seventy-one feet of scarp, on the south and west fronts, have been repaired during the year, out of the appropriation for contingencies of fortifications.

The work is in a condition to mount its entire armament, but the officers' quarters, destroyed by fire some years since, have not been rebuilt, and the new barracks are still unfinished.

If this work is to be a permanent one, the revetments should be rebuilt with stone.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860 ..... $1,000 00

Fort Porter, Black Rock, near Buffalo, New York, in charge of Lieutenant C. E. Blunt.—This fort is in good condition and prepared for its armament and garrison. During the year a small expenditure has been made, principally in repairing locks and in removing decayed portions of the wooden coping of the covered way parapet.

Fort Niagara, mouth of Niagara river, New York, in charge of Lieutenant C. E. Blunt.—A few hundred dollars have been spent during the year in repairs of sally-port and cribs for shore protection. The work is efficient as respects its readiness for its armament, but the accommodations for garrison and supplies are entirely inadequate; and if it is to be a permanent work, the entire revetment should be of

stone, and the site should be further protected from the action of the water.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	$800 00

Fort Ontario, Oswego, New York, in charge of Lieutenant C. E. Blunt.—Nothing has been done at this work. Though comparatively new, the timber revetments require extensive repairs, and though it is presumed the entire armament might now be mounted, the progressing decay of the gun platforms must soon require their replacement by stone. The accommodations for garrison and supplies are good. As at Forts Wayne and Niagara all the timber revetments should be replaced by stone, if the work is to be a permanent one.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	$500 00

Fort Montgomery, Rouse's Point, New York, in charge of Lieutenant C. E. Blunt.—Since the last report the unfinished masonry at the salient of the northwest bastion, the remaining embrasure in the bastion, and four of those in curtain IV have been finished, and the roofs of this curtain asphalted. The foundations for the guard-house have been laid, and all the stone cut for the superstructure.

This work could at short notice be prepared for mounting about half its armament.

Balance in treasury October 1, 1858	$1,500 00
Probable amount to be expended by July 1, 1859	1,500 00
Estimate of amount to be appropriated for fiscal year ending June 30, 1860	600 00

Fort Knox, Narrows of Penobscot river, Maine, in charge of Captain John D. Kurtz.—The year's operations embrace the completion of all the embrasures of the work, (nineteen,) and of four howitzer embrasures; the construction of the scarp of east fronts and bastion to within one course of the cordon; the building of the main entrance and two posterns, with the adjacent scarps; construction of three casemate piers and commencement of others; completion of parapet, breast-height, and terreplein for five guns on north covered way, with the centres and circles for the guns; construction of shot furnaces in north and south bastions; of about half the area walls of barracks and south ditch, and continuation of west glacis. The work is, on the whole, more than half finished; and in what pertains to its offensive efficiency, two-thirds or more.

The officer in charge asks for the next year an appropriation of $150,000, with which he expects to complete the eastern fronts of the work, (including the casemate arches, scarps, terrepleins, parapets, and provision for sixteen barbette guns,) to construct the storage magazines, build the scarp and casemates of the south front, and form the south place of arms, with provision for three barbette guns.

Balance in treasury October 1, 1858	$1,000 60
Probable amount to be expended by July 1, 1859	1,000 60
Estimate of amount to be appropriated for fiscal year ending June 30, 1860	600 00

Fort at entrance of Kennebeck river, Maine.—A project has been prepared by the board of engineers for this entrance, and terms have been agreed upon for the purchase of some land adjoining the property of the United States on the spot. No steps have been taken as yet in the way of commencing the actual construction of the work.

Balance in treasury October 1, 1858 ..... $99,000 00

Fort on Hog Island ledge, Portland harbor, Maine, in charge of Captain John D. Kurtz.—The work projected for this position having been approved, active operations were commenced on the opening of the season. Store rooms, depot, machinery, and apparatus have been provided, the work laid out, and the construction commenced. The remaining funds available will be applied to bringing the masonry to the level of the parade, and to filling the interior with earth.

Balance in treasury October 1, 1858	$49,000 00
Probable amount to be expended by July 1, 1859	49,000 00
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	500 00

Fort Winthrop, Boston harbor, Massachusetts, in charge of Lieutenant Charles S. Stewart.—On front No. 3 the scarp wall has been carried up 19′ 4″ and completed. On fronts Nos. 1, 2 and 4, for a length of 222 feet, the scarp wall has been raised 12′ 11″ to the base of the parapet wall. The parade wall of the third story, 160 feet in length, has been carried up 16′ 10″ to the coping. Thirteen piers have been built, completing those of the third story. The stairway has been brought to within two feet of the terreplein, and 14 of the casemate arches of the third story have been turned.

In all 1,172 cubic yards of stone and 490 cubic yards of brick masonry have been laid. By the end of the season the masonry of the scarp and parade walls will probably be completed.

Fort Independence, Boston harbor, Massachusetts, in charge of Lieutenant Charles S. Stewart.—The only work done has been to place thirteen chimney tops over the flues connecting with the officers' and soldiers' casemate quarters. It has not been thought advisable to make any more extended repairs at present. As soon as may be practicable the balance of the appropriation in the treasury will be applied to the completion of the magazines, gates, to the repairs of casemate quarters, the grading, flagging and drainage of the parade, &c.

No further appropriation is asked.

Balance in treasury October 1, 1858 ..... $9,923 27

Fort Warren, Boston harbor, Massachusetts, in charge of Lieutenant Charles S. Stewart.—During the year the interior finish has been

completed in ten rooms for soldiers' casemate quarters, each 29 by 17 feet. The finish has also been nearly all put up in 27 large rooms with fire places, and in 19 small rooms without, for officers' casemate quarters, and in the connecting halls and passages on curtain front No. 3.

The brick linings of the piers and the partition walls have been built for 17 rooms and their halls, and for two store-rooms on fronts Nos. 3 and 4; also, for three service magazines on fronts Nos. 1 and 2.

About 300 square yards of exterior slopes of curtain front No. 2 and the coverface have been faced with stone; 1,000 square yards of counterscarp and other walls have been pointed.

1,050 cubic yards of parapets have been embanked and 560 square yards of exterior slopes sodded.

This work is now essentially ready for mounting its armament bearing on the channel, and for a portion of the guns on the other fronts. Of the accommodations for the garrison, about one-half the rooms are finished or nearly so, and the remainder are in various states of forwardness.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860 ..... $600 00

Fortifications at entrance of New Bedford harbor, Massachusetts, in charge of Captain George W. Cullum, since May 10; *previously of Captain H. W. Benham.*—The recent government purchase of sixty acres of land at Clark's Point, not having included the roadways thereon, one of which passes through the site of the proposed fort, nothing has been done towards the erection of the fortifications. As directed by the Secretary of War on the 28th of May, 1858, the necessary legal steps are now being taken "for the calling of a jury for the assessment of any claims for ownership and easements of the land within the limits of the boundaries" of the domain belonging to the United States.

Should any balance remain out of the $150,000 appropriated by Congress after all the expenses are paid in acquiring the ownership and easements of the necessary site of the fort, it is proposed to apply it to building a wharf, procuring machinery, and taking other preliminary steps for the erection of the works at Clark's Point.

No further appropriation will be asked till the government shall have acquired the ownership and easements of the necessary site.

Balance in treasury October 1, 1858..... $68,500 00

Fort Adams, Newport harbor, Rhode Island, in charge of Captain George W. Cullum since May 10; *previously of Captain H. W. Benham.*—The scarp and parapet walls of the northeast bastion have been pointed and their cordon and coping joints filled with tarred oakum; the steps of the stairway near the northeast magazines have been rebuilt and pointed; the breast-height walls of the main work, except of the northwest bastion and north curtain, previously executed, of the east place of arms and of the covered way traverses have been pointed, their top surfaces plastered and asphalted, and covered in part with marsh sodding, to form the exterior parapet slopes; the

pumps and water pipes of officers' quarters have been repaired, and the south face of the permanent wharf repointed. Other minor and necessary details have been executed.

This work is now ready, except the modifications of some of the gun platforms for columbiads, for its entire armament. The casemates, with the exception of some trifling repairs, are all ready for the whole war garrison; but nothing more than the foundations of the exterior permanent quarters have been laid.

To complete and preserve this important work $50,000 could be advantageously applied during the next fiscal year, in rebuilding part of the permanent wharf and southwest breakwater, modifying gun platforms for the new armament, completing pointing and other necessary repairs, supplying chimney caps and ventilators, and executing other unfinished work.

Fort at Willett's Point, New York.—The commencement of the construction of this work still awaits a further appropriation. One of the first operations to be undertaken is the construction of a wharf, which if built in a permanent manner, so as to serve the purposes of the work during its construction and afterwards for the service of the post when garrisoned, will require more than the available balance on hand.

Balance in treasury October 1, 1858	$32,000 00
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	100,000 00

Fort Schuyler, East river, New York, in charge of Brevet Colonel John L. Smith since April 5; previously under Brevet Major J. G. Barnard.—The additional coping of the sea-wall has been nearly finished. What was commenced last year has been completed, with 275 feet of the length in addition, leaving 120 feet to complete.

There has been thorough repointing with cement mortar and mastic, and also painting of wood and iron work, where required; also extensive repairs of earth work and sodding.

Balance in treasury October 1, 1858	$9,999 56
Probable amount to be expended by June 30, 1859	9,999 56
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	20,000 00

Fort Wood and sea wall, Bedlow's island, New York harbor, in charge of Brevet Major J. G. Barnard.—No operations have been carried on here during the last season, for want of adequate means. The work yet remaining to be done consists in the completion of the sea-wall, altering the barbette platforms to adapt them to guns of heavier calibre, grading the glacis and terrepleins of the exterior battery, construction of new bridges, draw-bridges, &c.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	$500 00

Governor's Island, New York harbor; repairs of Fort Columbus and Castle Williams.—These works, which have been in charge of a garrison during the year, require for their full efficiency the alterations of their barbette platforms for the new armament, and Castle Williams also requires new balconies.

Fort Hamilton, New York harbor, in charge of Brevet Major J. G. Barnard.—The operations at this work have been exclusively confined to the completion of the new wharf described in the last annual report. On the 30th June the wharf was nearly completed, there remaining only the paving of the floor, a small portion of the coping course of stone, and the solid bulkhead to be done.

The operations for the fiscal year commencing July 1, 1858, consist in completing this wharf and such repairs to the old crib-work causeway or bridge as will make the new structure available.

This work is prepared to mount all its guns; but to receive the new armament the barbette gun platforms have to be changed, and at the same time this is done some work must be applied to the roofs and covering of the arches of the casemates of the water front.

Balance in the treasury October 1, 1858	$311 26
Probable amount to be expended by June 30, 1859	311 26

Fort Lafayette, New York harbor, in charge of Brevet Major J. G. Barnard.—On examination of the wooden structure which covers the batteries of this work, it was not deemed expedient to expend so much upon it as would be necessary to put it in good repair, nor to go to the expense of columbiad platforms for the upper tier of this work; and this view being confirmed by the acting chief engineer, nothing has been undertaken except the construction of a small permanent wharf in place of the old one, which had become unfit for further use. This work, which was only just commenced on the 30th of June, will be finished during the season.

No further appropriation is asked.

Balance in treasury October 1, 1858	$5,000 00
Probable amount to be expended by June 30, 1859	5,000 00

Fort Richmond, Staten Island, New York harbor, in charge of Brevet Major J. G. Barnard.—Since the 30th of September, 1857, the scarp wall has been raised generally about 7 feet 7 inches. The piers of the third tier of casemates have been raised to their full height; the arches of the south gorge-bastion and four arches on the south channel face, and two of those on the north channel face, turned.

A permanent wharf has likewise been commenced, and the piles for pier foundation driven, the stone for piers and superstructure collected and mostly dressed, and the iron work of superstructure collected.

The operations of the current year will consist in completing the third tier of arches and the scarp wall, asphalting the arches, putting on the earth-work of parapets and terrepleins, laying gun platforms, putting up drawbridge, stairways, building the main magazine in parade, doors and fittings of magazines. For other purposes, such as

deepening the ditch, completing the counterscarp, completing the wharf, in short, for finishing the work, an additional appropriation will be required of $15,000.

The whole number of channel bearing guns this work is intended to mount is 116; of this number, those of the first and second tiers of casemates, 56 in number may be mounted at short notice.

By the 30th of September, 1859, with the appropriation asked for, it is believed the work will be prepared to receive its full complement of guns, and in reference to all its arrangements, be thoroughly efficient for the object designed.

Balance in treasury October 1, 1858	$80,828 95
Probable amount to be expended by July 30, 1859	80,828 95
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	15,000 00

Fort Tompkins, Staten Island, New York harbor, in charge of Brevet Major J. G. Barnard.—An appropriation of $150,000 was made for this work for the fiscal year commencing July 1, 1857. As, however, the plans were not completed and approved by the War Department until the end of April, 1858, nothing could be done on the work before that date; and, owing to other causes, the commencement of actual operations was still further delayed until the 8th of July, when the work of demolishing the old fort and grading the site commenced.

This work will fully occupy a large gang of laborers during the remainder of the present season.

On the opening of the working season in the spring the foundations of the work will be commenced, and machinery put up for hoisting materials from the wharf to the level of the work, materials, &c., collected, and everything in readiness for commencing the superstructure.

Balance in treasury October 1, 1858	$129,500 00
Probable amount to be expended by June 30, 1859	129,500 00
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	120,000 00

Fort at Sandy Hook, New Jersey, in charge of Captain H. W. Benham.—A wharf for the reception of materials, and the necessary buildings for the accommodation of the force to be employed, have been completed; and active operations will be commenced as soon as the plans, now being prepared by a special board of engineers, shall have been completed and approved.

Balance in the treasury October 1, 1858	$180,000 00

Fort Delaware, Delaware river, in charge of Brevet Major John Sanders.—The scarp of four curtains has been carried up 10′, and of the bastions an average of 15′. The stair towers and four bastions have been carried up 20′; in the fifth, 30½. The piers of second tier arches have been carried up 10′ to full height in all the bastions, except (4–5) on curtain 4, and on half of curtain 3. The arches of second tier have been turned on curtains 1, 2, 3, 4, and in bastions, except 4–5. The piers of six

large arches, and the magazine walls on curtain 5, have been raised 8′,; and the magazine arches of that curtain turned. Officers' quarters carried up 5′. Flagging of gun rooms of first tier has been laid on two curtains and three bastions, and in gun room of second tier of one bastion and adjacent gun rooms. The stone arches of gateway have been turned, and the side walls and piers carried up 10′. Forty-five iron embrasures of second tier have been put in place, being all of that tier, except three in bastion 4–5.

The work is now essentially ready for two of its three tiers of guns.

Balance in treasury October, 1, 1858.....	$40,005 53
Probable amount to be expended by June 30, 1859.....	40,005 53
Estimate of amount to be appropriated for fiscal year, ending June 30, 1860.....	100,000 00

Fort Carroll, Sollers' Point flats, Maryland, in charge of Major H. Brewerton.—The foundation piles have all been sawed off, and the grillage timber laid. The scarp wall has been raised on the six fronts to heights varying from eighteen to twenty-four feet above the foundations; and on front No. 1 six of the embrasures have been commenced. The foundations of the piers and traverse circles have been completed, with the exception of foundations of piers of front 2. On this front, to the east of the gateway, the foundation of the magazine pier has been carried up one foot two inches; those of the remaining piers and cistern walls to the height of two feet ten inches; and tha of the parade wall to two feet. To the west of the gateway the foundation of the magazine pier has been raised two feet two inches, and those of the cisterns and parade walls one foot two inches. The wooden portion of the permanent wharf has been sunk in position. 2,196 cubic yards of sand were excavated from the bed of the river and placed within the area of the work during the month of October last, making the whole quantity of filling 87,757 cubic yards.

Balance in treasury October 1, 1858.....	$108,535 61
Probable amount to be expended by June 30, 1859.....	108,535 61

Fort Madison, Annapolis harbor, Maryland, in charge of Captain M. C. Meigs.—The wharf has been rebuilt; part of the sea-wall has been raised in height; a length of two hundred feet added, and the whole coped; pintle-blocks and traverse circles corrected in height, and, where necessary reset; the foundations of the old fort removed; parts of the parade and glacis graded; tool-house and smith's shop erected.

Balance in treasury October 1, 1858.....	$10,507 05
Probable amount to be expended by June 30, 1859.....	10,507 05
Estimate of amount to be appropriated for the fiscal year, ending June 30, 1860.....	30,000 00

Fort Monroe, Old Point Comfort, Virginia, in charge of Lieutenant Colonel R. E. De Russy; previously, of Brevet Colonel John L. Smith.—During the fiscal year, ending on the 30th of June, 1858, the seven magazines on front No. 6 have been completed. The pointing of the brick and stone masonry of the parade walls of the several fronts, of

the piers and arches of the casemates on fronts 2 and 3, and of breast-height walls of the parapet and covered way has been completed. The exterior slope of the parapet over the magazines on front No. 6 has been repaired and sodded, and the terreplein reformed.

The platforms for 32-pounders at the salients of fronts 3–4, 4–5, have been replaced by two platforms for 10-inch columbiads.

The draw and bridge in front No. 4 have been temporarily repaired, and the draw of bridge No. 7 has been replaced.

The counterscarp at the sluice on front No. 5 has been repaired, and the bridge over the sluice-way rebuilt.

Such temporary repairs as have been indispensable to preserve it in a serviceable condition have been given to the bridge of the permanent wharf.

This work is ready for the entire armament, as originally determined; but all the platforms for guns of heavier calibre designed to replace a part of these are yet to be provided, except the two built this year.

Balance in treasury October 1, 1858.....	$18,000 00
Probable amount to be expended by June 30, 1859.....	18,000 00

Artesian well, Fort Monroe, Old Point Comfort, Virginia.—No offers have been received for sinking the artesian well by contract, although advertisements were circulated.

It is now expected that proposals will shortly be made upon new advertisements.

Balance in the treasury October 1, 1858.....	$10,000 00
Probable amount to be expended by June 30, 1859.....	10,000 00

Bridge over Mill creek, Old Point Comfort, Virginia.—This bridge was repaired last fall, by replacing some of the piles, cap, and string pieces, and reflooring about half of the bridge. It will be in serviceable condition for about a year, at which time it should be rebuilt.

Castle Calhoun, Hampton Roads, Virginia, in charge of Lieutenant Colonel R. E. De Russy, since November 24, 1857; *previously of Brevet Colonel John L. Smith.*—During the fiscal year ending June 30, 1858, the masonry of the casemated portion of the old work has been removed and levelled for the reception of the first course of the new work. The red sand stone of the old embrasures has been moved and piled away; the spaces between the piers and the casemates have been partially filled up for the reception of the floring of the first tier; the first course of masonry of the new work (excepting the space reserved in the gorge for cisterns) has been entirely laid and the drainage pipes inserted in the piers; the wharf has been completed and two large cranes erected thereon; one hundred and eight piers of granite for the third course, not included in the stone contracted for, have been dressed; a stone arch and other foundations have been built for the lateral extension of the piers that connect with the stair towers; six large building derricks and thirteen smaller ones have been constructed and placed in position for future use.

Balance in treasury October 1, 1858	$45,048 00
Probable amount to be expended by the 30th June, 1859	45,048 00
Estimate of amount to be appropriated for the fiscal year ending on the 30th June, 1860	100,000 00

Fort Macon, and the preservation of its site, Beaufort harbor, North Carolina, in charge of Captain George W. Cullum until April 28, 1858; *since then of Brevet Captain J. G. Foster.*—This work is generally in good condition. A portion of the small balance on hand has been applied to such objects as were most indispensable to the preservation of the fort and wharf, but more yet remains to be done which could not be accomplished with the funds now available. The most important and pressing of the objects yet to be attended to is the repair of the jetties for the protection of the site which do not, in their present condition, fulfil their purpose. To accomplish this they must be built up higher and extended back into the beach.

Estimate of amount required to be appropriated for the fiscal year ending June 30, 1860	$300 00

Fort Caswell, and preservation of its site, Smithville, North Carolina, in charge of Captain G. W. Cullum until April 28, 1858; *since then of Brevet Captain J. G. Foster.*—This work has been undergoing thorough repairs, which will be completed this season. The more important of the operations undertaken are the repointing of the masonry generally; stopping leaks in roofs of caponniers; repairing roofs, gutters, pipes, and cisterns of citadel, and renewing decayed wood work, and painting and whitewashing rooms in same; repairing bridges; readjusting slopes and dike; repairing shot furnaces, and building fence around the site. The balance now applicable will suffice to complete the work in progress.

Repairs of Fort Moultrie, Charleston harbor, South Carolina, in charge of Captain G. W. Cullum until April 28, 1858; *since then of Brevet Captain J. G. Foster.*—Ten columbiad platforms, in the place of those for lighter guns, have been procured and put down upon the channel front of this work, the traverse circles have been laid, the pintle plates set, the interior slope of masonry made to conform to the service of the new guns, the pavement of the terreplein relaid, and every thing made complete for the mounting of the new armament.

Preservation of the site of Fort Moultrie, Charleston harbor, South Carolina, in charge of Captain G. W. Cullum until April 28, 1858; *since then of Brevet Captain J. G. Foster.*—Nothing has been done during the past year. The building up of the in-shore end of Bowman's jetty will be commenced as soon as the removal of the stone from the channel end, by the commissioners for the improvement of the harbor, is completed. The other jetties should be repaired and strengthened.

Fort Sumter, Charleston harbor, South Carolina, in charge of Captain G. W. Cullum until April 28, 1858; *since then of Brevet Captain J. G. Foster.*—The entire brick parapet of the barbette battery has been built up to its full height and finished; thus rendering this battery of fifty-thr e guns complete for service. The interior of the guard room and prison has been finished, two new implement rooms have been built and completed, the two stair towers at the gorge angles have been carried up to their full height, roofed, and completed, and the three others finished. The officers' quarters have been painted, the soldiers' barracks completed as far as possible before the platform arches are turned, and several matters connected with the completion of the quarters, magazines, and ante-rooms, have been attended to. The fort is now capable of mounting seventy per cent. of its whole armament. The magazines are all finished and bomb-proof, and now used to store a large quantity of ammunition. The store rooms are complete. The work remaining to be done is to construct the platform arches and embrasures for the second tier of guns, pave the first and second tiers of casemates and parade side walks, complete the soldiers' barracks, erect a new building for hospital, put up verandas in front of quarters, barracks, and hospital, construct additional cisterns on the parades, lay the traverse rails for first and second tiers of guns, rebuild the end of the stone wharf, provide boat harbors, point the masonry, complete the painting of iron and wood work, put up the portcullis, and attend to various minor details necessary for completing the fort.

Balance in the treasury October 1, 1858	$65,000 00
Probable amount to be expended by June 30, 1859	65,000 00
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	25,000 00

Preservation of the site of Fort Johnson, Charleston harbor, South Carolina, in charge of Captain G. W. Cullum until April 28, 1858; *since then of Brevet Captain J. G. Foster.*—Nothing has been done during the past year. As soon as it shall be determined to perfect the defences of the harbor against a land and sea attack, it will be necessary to build a new fort upon this excellent position, and for this purpose a new sea-wall nearer the channel than the present one, to serve for the foundations of the seaward walls of the fort, will be necessary. At present the balance in the treasury will be applied to repairing the most important breaks in the present sea-wall.

Repairs of quarters and barracks at Fort Johnson, Charleston harbor, South Carolina, in charge of Captain G. W. Cullum until April 28, 1858; *since then of Brevet Captain J. G. Foster.*—These repairs, which were commenced some years ago, should be completed at once. The work already done is not available for use in its incomplete state, and the buildings are suffering for further protection.

Repairs of Castle Pinckney, Charleston harbor, South Carolina, in charge of Captain G. W. Cullum until April 28, 1858; *since then of Brevet Captain J. G. Foster.*—This work has been thoroughly

repaired and placed in a good and efficient condition. The repairs and additions that have been made comprise repainting and cement washing all the walls and arches; repaving the casemates; readjusting the banquetts and terrepleins, repairing the main postern, putting in a new railing, and setting a new granite floor sill at the outer gate; the thorough repairing, replastering, and repainting of the buildings for officers' quarters, barracks, and hospital. Smaller details, relating to the drainage and police of the work, have been made as complete as practicable.

There still remains to rebuild with masonry the second cistern, for which the small amount on hand from the contingencies of fortifications will be sufficient.

Fort Pulaski, Savannah river, Georgia, in charge of Captain J. F. Gilmer.—During the year the decayed bricks in the jambs and arches of embrasures have been replaced and repointed; similar work in the gun casemates has been nearly finished. Brick covers have been built for the gorge stairways. The masonry for the enlarged sluices at the outlet of the feeding canal has been completed and the temporary dams for scouring the ditches placed in position. The work of cleaning the ditches of mud by the rush of tide-water has been commenced and so far carried on with satisfactory results. Materials for the proposed changes in the barbette platforms of the northeast front have been purchased. It yet remains to remodel the gun platforms to suit the new armament, to complete the pointing and other repairs, and to clean the ditches of mud. The work will then be ready for its armament and garrison.

Balance in the treasury October 1, 1858	$13,300 00
Probable amount to be expended by June 30, 1859	13,300 00
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	500 00

Fort Jackson, Savannah river, Georgia, in charge of Captain J. F. Gilmer.—During the year the arrangement of the sluice-gate and the masonry of the wharf have been finished; the walls and roof of the soldiers' barracks have been built; the foundations of the traverse circles and pintle blocks of the flank defences prepared. The work yet to be done is to complete the construction of officers' and soldiers' quarters, to enclose the gorges of the half bastions, to roof the flank batteries and to establish their platforms, to erect cisterns, build draining culverts, and complete the gateway. The work is now ready for its barbette battery.

Balance in treasury October 1, 1858	$600 00
Probable amount to be expended by June 30, 1859	600 00
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	500 00

Fort Clinch, Amelia Island, Florida, in charge of Lieutenant W. H. C. Whiting.—Expenditures have been directed to building the roof surfaces of northwest bastion in concrete, parapet of northwest bas-

old pattern, should be prepared for the heavier guns for which it is designed, and, in connexion therewith, extensive repairs must be made to the roofs of the casemates, which leak badly. Further protection to the site should also be promptly made, or this work so important to the defences of the harbor may be undermined and destroyed.

Fort Barrancas and barracks thereat, in charge of Lieutenant F. E. Prime, since the 4th of March; previously of Captain John Newton.—The operations on the fort have been limited to repairs of a magazine in Spanish battery, and general repairs and preservation of wood and iron work. At the advanced redoubt all the masonry without the ditch has been completed, and also within the ditch, except a part of the breast-height wall, the main entrance and the platform for barbette guns. All the joints of coping of main work have been caulked with bitumen, the covered way and traverses put in grass, the terreplein and parapet of main work in a great measure embanked, and the glacis almost entirely graded, the magazines are all finished. At the barracks, the wood and iron work have been repaired and painted and the glazing renewed.

Fort Morgan, Mobile Point, Alabama, in charge of Lieutenant F. E. Prime since 15th February; previously Brevet Major J. G. Barnard.—Repairs of pavement of terreplein of main work finished; 20 columbiad platforms laid and ready for service; the pintles of the remaining guns of main work strengthened by a brick platform; parapet of north bastion covered with experimental brick pavement on one-half and with two coats of plaster on the other; breast-height wall of main work carried to its full height by an 8-inch brick wall, and altered where necessary for the new armament; irons of shot furnaces lackered and doors built up with bricks; fences of fort and officers' quarters repaired, and some repairs to soffits of casemate arches.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860..... $500 00

Fort Gaines, Dauphin island, Mobile bay, Alabama, in charge of Lieutenant Fred. E. Prime since 15th February; previously of Brevet Major J. G. Barnard.—The glacis is wholly embanked on three of the fronts and partly on the other two; the parade is partly graded, and the ramparts partly embanked on four of the fronts. Two of the bastions are now raised to a height of 12′, and the other three to heights of 14′, 8′, and 6′, respectively. The magazine arches in two of the bastions have been turned, the south and southeast posterns finished, the northeast postern made ready for its arch, and the foundation of the other posterns prepared.

The officer in charge estimates that $100,000 will be required for the completion of the work.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860..... $600 00

Fortifications for defence of the inner passes into Mobile bay, (known as Grant's Pass and Pass au Héron.)—A tower to cover these passes

has been projected, but no actual operations have been undertaken owing to the condition of the treasury, which has required that the expenditures on all new works should be the least possible. No appropriation is asked for the next year.

Balance in treasury, October 1, 1858..... $99,850 00

Fort on Ship island, coast of Mississippi, in charge of Lieutenant N. F. Alexander.—The actual construction of the fort has not been commenced, the jurisdiction of the site not having been ceded to the United States by the State of Mississippi. The field work of the survey of the site and vicinity of the fort is finished, and the maps nearly completed.

It is proposed to apply the present appropriation to constructing a temporary wharf and temporary buildings necessary for the construction of the fort; to excavating for, and laying the foundations of the scarp and parade walls and piers; to raising the walls and piers to the height of the springing lines of the arches; to turning the arches of the gun rooms and magazines, and to laying the traverse circles of the first tier of guns. No appropriation is asked for next year.

Balance in treasury October 1, 1858..... $85,000 00

Fort Pike, Rigolets, Louisiana, in charge of Lieutenant W. H. Stevens.—Is in excellent condition. The defence will be increased by the proposed substitution of 4-8″ columbiads and 7-8″ sea-coast howitzers for as many 24 pounders.

The sea-wall of the hospital needs some extension. For enlarging the gun platforms, rearranging drawbridge, and extension of sea-wall, an appropriation will be needed.

Estimate of amount to be appropriated for fiscal year ending June 30, 1860..... $500 00

Fort Macomb, Chef Menteur, Louisiana, in charge of Lieutenant W. H. Stevens.—This work, which is in pretty good condition, is ready for its original armament, part of which should, however, be replaced by 4-8″ columbiads and 7-8″ sea-coast howitzers, for which platforms are still to be provided. The drawbridge needs some repairs, also the revetment of the counterscarp. The revetment of the bank of the bayou ought also to be extended.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860..... $500 00

Battery Bienvenue, Bayou Bienvenue, Louisiana, in charge of Lieutenant W. H. Stevens.—This work is generally in good condition, and, with the exception of two 8″ columbiad platforms is ready for its armament. For the revetment of interior slope of parapet, which needs renewing, it is proposed to substitute a brick breast-height wall.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860..... $500 00

old pattern, should be prepared for the heavier guns fo
designed, and, in connexion therewith, extensive repairs
to the roofs of the casemates, which leak badly. Furth
to the site should also be promptly made, or this work
to the defences of the harbor may be undermined and de

Fort Barrancas and barracks thereat, in charge of Lieu Prime, since the 4th of March; previously of Captain Joh The operations on the fort have been limited to repairs of in Spanish battery, and general repairs and preservation iron work. At the advanced redoubt all the masonry ditch has been completed, and also within the ditch, exce the breast-height wall, the main entrance and the platfo bette guns. All the joints of coping of main work have b with bitumen, the covered way and traverses put in grass plein and parapet of main work in a great measure emb the glacis almost entirely graded, the magazines are all fin the barracks, the wood and iron work have been repaired a and the glazing renewed.

Fort Morgan, Mobile Point, Alabama, in charge of Lieut Prime since 15th February; previously Brevet Major J. G. Repairs of pavement of terreplein of main work finished; 20 platforms laid and ready for service; the pintles of the guns of main work strengthened by a brick platform; parap bastion covered with experimental brick pavement on on with two coats of plaster on the other; breast-height wa work carried to its full height by an 8-inch brick wall, a where necessary for the new armament; irons of shot furn ered and doors built up with bricks; fences of fort and officers repaired, and some repairs to soffits of casemate arches.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860.....

Fort Gaines, Dauphin island, Mobile bay, Alabama, in Lieutenant Fred. E. Prime since 15th February; previously Major J. G. Barnard.—The glacis is wholly embanked on the fronts and partly on the other two; the parade is partly and the ramparts partly embanked on four of the fronts. Tw bastions are now raised to a height of 12′, and the other heights of 14′, 8′, and 6′, respectively. The magazine arches of the bastions have been turned, the south and southeast finished, the northeast postern made ready for its arch, and t dation of the other posterns prepared.

The officer in charge estimates that $100,000 will be requ the completion of the work.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860..... $

Fortifications for defence of the inner passes into Mobile bay, (as Grant's Pass and Pass au Héron.)—A tower to cover these

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Tower Duprê, Bayou Duprê, Louisiana, in charge of Lieutenant W. H. Stevens.—In pretty good condition, and ready for armament except the platforms for two 8″ columbiads.

Tower at Proctor's Landing, Lake Borgne, Louisiana, in charge of Brevet Major P. G. T. Beauregard—During the last year the interior walls and the piers of groined arches of the roof have been raised to their full height, and the first four courses of the latter corbelled out as required; the scarp wall has been raised, except at the embrasures, to the height of 27′, leaving 17′ 6″ of it yet to be finished; the main entrance and the loop-hole openings of the lower story have been completed, and the breast-height walls have been concreted to 8′ as called for. The revetment of the outer ditch has been finished, grillage foundations of breast-height walls and gun platforms laid, and the iron girders and beams of the first and second floors have been put in position.

The bottoms of both ditches have been levelled, the parapet of the exterior battery roughly formed and rammed, and the breast-height wall foundations of the land fronts loaded.

To complete this work it will be necessary to raise the scarp wall of the towers to its full height; to put up the drawbridge, all the castings of which are made; to put in the iron embrasures of the second story, and segmental arches of the first and second floors; to construct the groined arches of the roof and third floor, and finish generally the interior of the tower as quarters. The permanent quarters in the exterior battery have also to be finished, the breast-height wall of the latter constructed, and parapets formed properly and levelled. The pintle blocks and traverse circles of its armament, which have been received but not yet set, will have to be laid, the magazine constructed, and the levee around site of fort raised one foot and strengthened.

Estimate of the amount to be appropriated for the fiscal year ending June 30, 1860	$500 00

Fort Jackson, Mississippi river, Louisiana, in charge of Brevet Major P. G. T. Beauregard.—The means at present available will complete the construction of the lower exterior battery, so as to have it ready for its proposed total armament of 31 barbette guns by the 1st of January next. The residue of the appropriation will be expended in repairing, raising, and strengthening the small levee around the site of the fort, which has been completely overflowed by the late extraordinary rise in the waters of the Mississippi river.

The main work, which is in good defensible condition, has many of its casemates and barbette guns already mounted, and the balance could be mounted at any time.

Balance in the treasury October 1, 1858	$5,650 00
Probable amount to be expended by June 30, 1859	5,650 00

Fort St. Philip, Mississippi river, Louisiana, in charge of Brevet Major P. G. T. Beauregard.—Since the last annual report the operations at this work have consisted in reconstructing in timber founda-

tions the relieving arches of face 2, and part of those on face 5, with their corresponding parapets; increasing the width of foundations of some other relieving arches of land fronts, and nearly completing other repairs of some fronts.

The sum available on the 30th of June, 1858, will complete the repairs of the interior of the work; that is, relevel and repair all walls and parapets disturbed by unequal settlement, level parade and construct its gutters and drains, and set all pintle blocks and traverse circles. The additional sum of $10,000 is needed to excavate the main ditch to its proper depth; to finish glacis, breast-height walls, and terrepleins around the fort; to repair upper and lower batteries, and put in good order all their gun traverses; and to repair levee all round the site of the work.

At present the 28 gun platforms of the old amament of the lower exterior battery are in good order and condition. The change of ten of them to columbiad platforms, and the resetting the 28 gun platforms of the upper exterior battery, which are entirely out of level now by undue settlement, will be effected as soon as an appropriation for the purpose shall be granted. Those of the interior of the main work (37 in all) will be set ready for their guns before the expiration of the present fiscal year.

Balance in treasury October 1, 1858	$5,669 24
Probable amount to be expended by June 30, 1859	5,669 24
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860.....	500 00

Fort Livingston, Grand Terre island, Louisiana, in charge of Lieutenant W. H. Stevens.—This work, which has been standing several years in an unfinished condition, awaiting its final settlement, may now be completed. It still requires for its efficiency the grading of the parapets, laying the gun platforms, completing inside quarters, drawbridge, and magazines; grading glacis, raising floor of counterscarp gallery, and completing works for the security of the site. These works for the protection of the site have been carried on to some extent during the past year.

Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	$600 00

Fortifications for the defence of the entrance to Galveston harbor and bay, Texas.—Here, as at other new works, no operations have been undertaken, owing to the necessity of reducing expenditures as much as possible, on account of the condition of the treasury.

Forts on the frontier of Texas.—From the failure of obtaining titles to the sites, no actual operations could be undertaken.

Fortifications on Fort Point, entrance to San Francisco bay, in charge of Brevet Major Z. B. Tower.—During the year the work generally has been carried up two stories, with the exception of turning the third tier of arches of gorge.

The scarp throughout the entire length has been carried up an average height of 27 feet, including the construction of 60 gun embrasures. The piers of the second tier have been carried up 10½ feet; upon them have been turned the arches and communication arches, and the sprandles filled with concrete.

The piers of the third tier, excepting those next parade of gorge, have been carried up—those of the water fronts 6½ feet, and those of the gorge 7½ feet. The arches and communication arches of the water fronts have been turned, and upon the arches has been built the parade retaining wall of the terreplein to the proper height to receive its coping. The masonry of the four service magazines for the second and third tiers has been carried up, including the setting of the stone steps—one of them 22 feet, another 32½ feet, and the third 24 feet. The iron work of the gallery in front of the officers' quarters, including the stone bases, columns, girders, and entablature, has been put up.

The masonry of the counterscarp gallery, including the construction of five howitzer embrasures, has been commenced, and finished to receive the covering of asphaltic mastic, except the pavement, pointing of arches, and coping. The sum asked for will be applied to completing the main work.

Balance in treasury October 1, 1858	$153,834 70
Probable amount to be expended by June 30, 1859	153,834 70
Estimate of amount to be appropriated for fiscal year ending June 30, 1860	50,000 00

Fortifications on Alcatrazes island, San Francisco bay, California, in charge of Lieutenant F. E. Prime until December 31, 1857; *since then of Lieutenant J. B. McPherson.*—The earth in front of scarp wall and caponnière of south battery has been graded, and a concrete slope of 2′ wide and 6″ thick carried along the foot to throw the water from the foundation; a small remaining portion of the parapet of three-gun battery sodded, and concrete slopes formed in vicinity of south wing wall to render the bank more difficult of ascent.

Four hundred and eighty-six running feet of coping have been laid on scarp walls of north battery, caponnière, and ten-gun battery, breast-height walls finished, parapets filled and sodded, and masonry parapet of caponnière paved with brick; circular brick retaining walls, stone platforms, traverse circles, and banquetts finished.

In the west battery the parapet has been filled and sodded; gun platforms, traverse circles, and banquetts completed; shot furnace built; masonry and carpenters' work of magazine finished, and roof surfaces covered with asphalt.

The masonry of guard house has been finished, stone steps leading from level of roadway through same to terreplein, hence to road leading to barracks set, and small brick retaining wall in rear built and coped. The defensive walls, adjacent to the guard house, leading to ten-gun battery and the wharf, built ready for the coping.

The excavation for the defensive barracks, counterscarp wall, and cistern has been completed, main walls on north and west fronts car-

ried 12′ 8″ above the basement floor, and on east and south fronts 9′ 6½″; the partition walls of the basement story carried to a level of main floor, cast iron girder set, and brick arches turned and levelled up with concrete ready to receive the flooring strips. Some few necessary repairs have been done to the wharf, and considerable progress made in escarping on the east and west sides of the island.

The balance available will be applied to completing the details of the batteries, caponnières, guard house and walls, barracks, and replacing wooden platforms in the north and south batteries by stone. To finish the above works and construct additional cisterns, service magazines, &c., an appropriation is asked.

Balance in treasury October 1, 1858	$38,749 28
Probable amount to be expended by June 30, 1859	38,749 28
Estimate of amount to be appropriated for the fiscal year ending June 30, 1860	50,000 00

Respectfully submitted,

H. G. WRIGHT,
Captain of Engineers in charge of Bureau.

Hon. JOHN B. FLOYD,
Secretary of War.

Extract from report of Brevet Colonel S. Thayer, Commanding Corps of Engineers.

HEADQUARTERS CORPS OF ENGINEERS,
Boston, Massachusetts, November 12, 1858.

SIR: I have the honor to submit the following report of the progress and condition of those branches of the public service committed to the Engineer department, for the year ending on the 30th of June, 1858.

* * * * * * * *

Hon. JOHN B. FLOYD,
Secretary of War.

MILITARY ACADEMY.

The report of the late Board of Visitors, hereto appended, shows the condition of the institution, and is but another added to the many previous testimonials to its high character, the eminent ability of its professors, the excellence of its discipline, and the able administration of its affairs.

Although the academy is in a flourishing condition, there are some points in the laws and regulations for its organization and government which might be changed with advantage, and to these, if desired, your attention will be invited in a separate report.

List of officers, professors, and cadets—Continued.

Names.	Rank.	Corps or regiment.	Where born.	Appointed from—	Department.
James G. Benton	Captain	Ordnance	New Hampshire	Military Academy	Instructor of ordnance and gunnery.
And. J. Donelson	1st lieutenant	Engineers	Tennessee	do	Instructor of practical engineering.
Henry M. Robert	Bvt. 2d lieutenant	do	South Carolina	do	Assistant instructor of practical engineering.
John C. Kelton	1st lieutenant	6th infantry	Pennsylvania	do	Instructor in the use of small arms.
Antoni Lorentz			France	New York	Sword master, assistant to the instructor in the use of small arms.
MILITARY STAFF.					
James B. Fry	1st lieutenant	1st artillery	Illinois	Military Academy	Adjutant.
Samuel P. Moore, M.D.	Surgeon	Medical department	South Carolina	South Carolina	
John Campbell, M.D.	Assistant surgeon	do	New York	New York	
John Gibbon	1st lieutenant	4th artillery	Pennsylvania	Military Academy	Quartermaster.

List of officers, professors, and cadets of the United States Military Academy, September 30, 1858, showing the names, rank, where born, and State or country from which appointed.

Names.	Rank.	Corps or regiment.	Where born.	Appointed from—	Department.
Richard Delafield	Colonel	Engineers	New York	Military Academy	Superintendent and commandant.
ACADEMIC STAFF.					
Dennis H. Mahan, LL.D	Professor		New York	Engineer corps	Professor of civil and military engineering.
Thomas L. Casey	1st lieutenant	Engineers	do	Military Academy	Assistant professor of engineering.
Richard K. Meade, jr	Bvt. 2d lieutenant	do	Virginia	do	Acting assistant professor of engineering.
Wm. H. C. Bartlett, LL.D	Professor		Pennsylvania	Engineer corps	Professor of natural and experimental philosophy.
John M. Schofield	1st lieutenant	1st artillery	New York	Military Academy	Assistant professor of natural and experimental philosophy.
John R. Smead	do	2d artillery	do	do	A ting assistant professor of natural and experimental philosophy.
Albert E. Church, LL.D	Professor		Connecticut	3d artillery	Professor of mathematics.
Absalom Baird, A. M	1st lieutenant	1st artillery	Pennsylvania	Military Academy	Assistant professor of mathematics.
Adam J. Slemmer	do	do	do	do	Acting assistant professor of mathematics.
Mathew M. Blunt, A.M	do	2d artillery	New York	do	
Oliver O. Howard	do	Ordnance	Maine	do	
Alex'r S. Webb	2d lieutenant	2d artillery	New York	do	
Wm. J. Hardee	Lt. Col. Engineers	Bvt. lieut. col. U. S. A., and maj. 2d cavalry.	Georgia	do	Commandant of cadets, and instructor of artillery, cavalry and infantry tactics.
Richard J. Dodge	1st lieutenant	8th infantry	North Carolina	do	Assistant instructor of infantry tactics.
Charles H. Field	do	2d cavalry	Kentucky	do	Assistant instructor of cavalry.
George L. Hartsuff	do	2d artillery	New York	do	Assistant instructor of artillery.
Robert Williams	do	1st dragoons	Virginia	do	Assistant instructor of cavalry.
Alex'r M. D. McCook	2d lieutenant	3d infantry	Ohio	do	Assistant instructor of infantry tactics.
Robert W. Weir, N. A	Professor		New York	New York	Professor of drawing.
Henry Douglass	1st lieutenant	9th infantry	do	Military Academy	Assistant professor of drawing.
James McMillan	2d lieutenant	2d infantry	do	do	Acting assistant professor of drawing.
Hyacinth R. Agnel	Professor		do	New York	Professor of the French language.
Samuel F. Chalfin	1st lieutenant	1st artillery	Illinois	Military Academy	Assistant professor of the French language.
Edward R. Platt	do	2d artillery	Vermont	do	Acting assistant professor of the French language.
Rev. Jno. W. French, A.M	Professor		Connecticut	District of Columbia	Chaplain and professor of ethics and English studies.
Henry C. Symonds	1st lieutenant	2d artillery	Massachusetts	Military Academy	Assistant professor of ethics and English studies.
John T. Greble, A.M	do	do	Pennsylvania	do	Acting assistant professors of ethics and English studies.
Fred. L. Childs	2d lieutenant	1st artillery	Maine	do	
Francis Beach	Bvt. 2d lieutenant	2d artillery	Connecticut	do	
Henry L. Kendrick, A.M	Professor		New Hampshire	2d artillery	Professor of chemistry, mineralogy and geology.
Caleb Huse	1st lieutenant	1st artillery	Massachusetts	Military Academy	Assistant professor of chemistry.
Patrice de Janan	Professor		Carthagena	New York	Professor of the Spanish language.

List of officers, professors, and cadets—Continued.

Names.	Rank.	Corps or regiment.	Where born.	Appointed from—	Department.
James G. Benton	Captain	Ordnance	New Hampshire	Military Academy	Instructor of ordnance and gunnery.
And. J. Donelson	1st lieutenant	Engineers	Tennessee	do	Instructor of practical engineering.
Henry M. Robert	Bvt. 2d lieutenant	do	South Carolina	do	Assistant instructor of practical engineering.
John C. Kelton	1st lieutenant	6th infantry	Pennsylvania	do	Instructor in the use of small arms.
Antoni Lorentz			France	New York	Sword master, assistant to the instructor in the use of small arms.
MILITARY STAFF.					
James B. Fry	1st lieutenant	1st artillery	Illinois	Military Academy	Adjutant.
Samuel P. Moore, M.D	Surgeon	Medical department	South Carolina	South Carolina	
John Campbell, M.D	Assistant surgeon	do	New York	New York	
John Gibbon	1st lieutenant	4th artillery	Pennsylvania	Military Academy	Quartermaster.

List of officers, professors, and cadets—Continued.

CADETS.

No.	Names.	Where born.	Whence appointed.
	First Class.		
1	William E Merrill	Wisconsin	At large
2	Samuel H. Locket	Virginia	Alabama
3	Charles R. Collins	Pennsylvania	Pennsylvania
4	Orlando G. Wagner	Pennsylvania	Pennsylvania
5	Chauncey B. Reese	New York	New York
6	Francis L. Guenther	New York	New York
7	Edward G. Bush	Illinois	Illinois
8	Moses H. Wright	Tennessee	Tennessee
9	Robert F. Bockham	Virginia	Virginia
10	Elias B. Carling	Maryland	Maryland
11	Jonathan N. Hall	New York	Michigan
12	Roderic Stone	Maine	Minnesota
13	Allen L. Anderson	Ohio	Ohio
14	Martin D. Hardin	Illinois	At large
15	Francis J. Crilly	Pennsylvania	Pennsylvania
16	Eugene M. Baker	New York	New York
17	Edwin H. Stoughton	Vermont	Vermont
18	Caleb H. Carlton	Ohio	Ohio
19	Abraham K. Arnold	Pennsylvania	Pennsylvania
20	Henry A. F. Worth	Virginia	At large
21	Joseph Wheeler, jr	Georgia	New York
22	John J. Upham	Delaware	Wisconsin
	Second Class.		
1	Walter H. McFarland	New Jersey	New York
2	John A. Tardy, jr	New York	New York
3	Horace Porter	Pennsylvania	Pennsylvania
4	Nicholas Bowen	New York	New York
5	Benjamin F. Sloan, jr	South Carolina	South Carolina
6	James M. Whittemore, jr	Massachusetts	Massachusetts
7	James H. Wilson	Illinois	Illinois
8	John M. Wilson	District of Columbia	Washington Territory
9	Theodore Edson	Massachusetts	Massachusetts
10	William W. McCreery, jr	Virginia	At large
11	Cornelius Hook, jr	Illinois	Illinois
12	Alanson M. Randol	New York	New York
13	Daniel D. Lynn	Indiana	Indiana
14	Samuel A. Foster	Maine	Maine
15	Josiah H. Kellogg	Pennsylvania	Pennsylvania
16	Alexander C. M. Pennington, jr	New Jersey	New Jersey
17	Stephen D. Ramseur	North Carolina	North Carolina
18	Edward R. Hopkins	New York	New York
19	John R. B. Burtwell	Alabama	Alabama
20	George S. Hollister	New York	New York
21	John M. Kerr	North Carolina	North Carolina
22	James P. Martin	Kentucky	At large
23	Albert M. Powell	Maryland	Maryland
24	William G. Jones	Ohio	Ohio
25	John N. Andrews	Delaware	Delaware
26	Martin V. B. Lewis	New York	New York
27	Wesley Merritt	New York	Illinois
28	Alfred T. Smith	Missouri	Illinois
29	James M. Warner	Vermont	Vermont
30	Lyman Mishler	Pennsylvania	Pennsylvania
31	George W. Vanderbilt	New York	New York
32	Samuel T. Cushing	Rhode Island	Rhode Island
33	Robert H. Hall	Michigan	Illinois
34	William H. Jordan	Ohio	Ohio
35	Salem S. Marsh	Massachusetts	Massachusetts
36	Frank Huger	Virginia	At large
37	Charles S. Bowman	Florida	At large
38	Wade H. Gibbes	South Carolina	South Carolina
39	Edward B. D. Riley	Indian Territory	At large
40	Harold Borland	North Carolina	Arkansas
41	John J. Sweet	Illinois	Illinois
42	Theodore W. M. Coontz	Virginia	Virginia
	Third Class.		
1	Henry A. Dupont	Delaware	At large
2	Henry W. Kingsbury	Illinois	New York
3	Charles E. Cross	Massachusetts	Massachusetts
4	Llewellyn G. Hoxton	District of Columbia	At large
5	Orville E. Babcock	Vermont	Vermont
6	Adelbert Ames	Maine	Maine

List of officers, professors, and cadets—Continued.

No.	Names.	Where born.	Whence appointed.
7	Nathaniel R. Chambliss	Virginia	Tennessee
8	Adelbert R. Buffington	Virginia	Virginia
9	Samuel N. Benjamin	New York	New York
10	Francis A. Davies	Pennsylvania	At large
11	Charles McK. Leoser	Pennsylvania	Pennsylvania
12	John J. Rodgers	Pennsylvania	Pennsylvania
13	Henry C. Hasbrouck	New York	New York
14	Franklin Harwood	Rhode Island	At large
15	George W. Dresser	Connecticut	Massachusetts
16	Edmund Kirby	New York	At large
17	Emery Upton	New York	New York
18	Charles E. Hazlett	Ohio	Ohio
19	Leonard Martin	Wisconsin	Wisconsin
20	John W. Barlow	New York	Wisconsin
21	Judson Kilpatrick	New Jersey	New Jersey
22	Charles C. Campbell	Missouri	Missouri
23	William A. Elderkin	New York	New York
24	John Adair, jr	Kentucky	Oregon
25	Jacob F. Kent	Pennsylvania	Pennsylvania
26	Erskine Gittings	Maryland	Maryland
27	Robert L. Eastman	Maryland	At large
28	Guy V. Henry	Indian Territory	At large
29	Jacob H. Smyser	Pennsylvania	Pennsylvania
30	Charles E. Patterson	Indiana	Arkansas
31	Malbone F. Watson	New York	New York
32	Eugene B. Beaumont	Pennsylvania	Pennsylvania
33	J. Benson Williams	Michigan	Michigan
34	Leroy L. James	Ohio	Ohio
35	John Pelham	Alabama	Alabama
36	George A. Thornton	Virginia	Virginia
37	Campbell D. Emory	Pennsylvania	At large
38	James M. Kennard	Mississippi	Mississippi
39	Jacob B. Rawles	Michigan	Michigan
40	Mathias W. Henry	Kentucky	Kentucky
41	Samuel C. Williams	Tennessee	Tennessee
42	Thomas L. Rosser	Virginia	Texas
43	James F. McQuesten	New Hampshire	New Hampshire
44	John J. Poland	Indiana	Indiana
45	Henry B. Noble	New York	New York
46	Charles H. Gibson	Pennsylvania	Pennsylvania
47	Olin F. Rice	Georgia	Kentucky
48	George O. Sokalski	New York	New York
49	Sheldon Sturgeon	New York	New York
50	Wright Rives	District of Columbia	At large
	Fourth Class.		
1	Arthur H. Dutton	Connecticut	Connecticut
2	Francis U. Farquhar	Pennsylvania	Pennsylvania
3	Patrick H. O'Rorke	Ireland	New York
4	Charles C. Parsons	Ohio	Ohio
5	Richard M. Hill	District Columbia	At large
6	David H. Buel	Michigan	New York
7	Clarence Derrick	District of Columbia	At large
8	Alfred Mordecai	Pennsylvania	At large
9	Thomas C. Bradford	Rhode Island	Rhode Island
10	William H. Harris	New York	New York
11	Laurence J. Babbitt	Massachusetts	At large
12	John F. O'Brien	Pennsylvania	At large
13	Julius W. Adams, jr	Massachusetts	Kentucky
14	Charles P. Ball	Alabama	Alabama
15	George H. Frost	Louisiana	Louisiana
16	Francis H. Parker	New York	New York
17	Joseph C. Audenried	Pennsylvania	Pennsylvania
18	Alexander D. Moore	North Carolina	North Carolina
19	Lucien D. Sandige	Alabama	Louisiana
20	John R. Edie, jr	Pennsylvania	Pennsylvania
21	William F. Niemeyer	Virginia	At large
22	J. Pearson Farley	District of Columbia	At large
23	John W. Lea	North Carolina	Mississippi
24	Paul F. Faison	North Carolina	North Carolina
25	William R. Jones	Virginia	Virginia
26	George A. Woodruff	Michigan	Michigan
27	Robert H. Logan	Virginia	Virginia
28	Peter C. Haines	Pennsylvania	New Jersey
29	William D. Fuller	Maine	Maine
30	John J. Garnett	Virginia	Virginia
31	Joseph B. Campbell	Pennsylvania	New Hampshire
32	Stephen C. Lyford, jr	New Hampshire	New Hampshire
33	John Lane	Indiana	At large
34	David G. White	Maryland	Maryland

List of officers, professors, and cadets—Continued.

No.	Names.	Where born.	Whence appointed.
35	Benjamin King	District of Columbia	At large
36	Felix H. Robertson	Texas	Texas
37	Charles H. Brightley	Pennsylvania	Pennsylvania
38	James P. Drouillard	Ohio	Ohio
39	Zadock T. Willett	Tennessee	Tennessee
40	Alonzo H. Cushing	Wisconsin	New York
41	Eugene Carter	Maine	Maine
42	Edward S. Willis	Georgia	Georgia
43	Pierce B. Young	South Carolina	Georgia
44	Henry E. Noyes	Maine	Massachusetts
45	Jesse J. Watkins	Virginia	Virginia
46	Leroy S. Elbert	Ohio	Iowa
47	George N. Reynolds	South Carolina	South Carolina
48	Justin E. Dimick	New Hampshire	At large
49	Elijah H. Holton	Kentucky	Kentucky
50	Charles N. Warner	Pennsylvania	Pennsylvania
51	James P. Parker	Kentucky	Missouri
52	William H. Browne	Virginia	Virginia
53	John H. Kelley	Alabama	California
54	Samuel P. Ferris	Connecticut	Connecticut
55	James M. Lancaster	Kentucky	Kentucky
56	Philip H. Remington	Connecticut	Illinois
57	George D. Talbot	Missouri	Mississippi
58	George A. Custer	Ohio	Ohio
59	William W. Dunlap	Kentucky	Kentucky
60	J. Bayard Whittemore	New York	At large
61	Frank A. Reynolds	Virginia	New Mexico
62	George O. Watts	Kentucky	Kentucky
63	Daniel W. Flagler	New York	New York
	Fifth Class.		
1	Joseph A. Alexander	South Carolina	Georgia
2	Isaac Arnold, jr	Connecticut	Connecticut
3	William C. Barnard	Pennsylvania	New Jersey
4	James Barrow	Georgia	Georgia
5	William C. Bartlett	New York	At large
6	William S. Bebee	New York	At large
7	William T. Blakistone	Maryland	Maryland
8	Ozias A. Blanchard	Maine	Maine
9	John R. Blocker	South Carolina	At large
10	Joseph G. Blount	Georgia	Georgia
11	Asa Bolles	Ohio	Ohio
12	George Burroughs	New Jersey	Massachusetts
13	John H. Calef	Massachusetts	Massachusetts
14	Clemens C. Chaffee	New York	Massachusetts
15	William B. Chapman	New York	Massachusetts
16	George W. Clayton	North Carolina	North Carolina
17	Clifton Comly	Ohio	Ohio
18	Vanaleve Coonrod	Ohio	Ohio
19	James P. Cox	Virginia	Virginia
20	James Dearing	Virginia	Virginia
21	Joseph K. Dixon	Mississippi	Mississippi
22	Henry C. Dodge	New York	New York
23	James P. Drake, jr	Indiana	Indiana
24	Bartholomew Dupuy	Kentucky	Kentucky
25	John Egan	Vermont	New York
26	Henry S. Farley	South Carolina	South Carolina
27	George L. Gillespie, jr	Tennessee	Tennessee
28	James Hamilton	Rhode Island	South Carolina
29	Frank B. Hamilton	Ohio	Ohio
30	Frederick J. James	New York	New York
31	John B. Johnson	Georgia	Georgia
32	Richard S. Kinney	Virginia	Virginia
33	John A. Kress	Pennsylvania	Indiana
34	James H. Lord	Pennsylvania	Pennsylvania
35	George S. Lovejoy	North Carolina	North Carolina
36	Tully McCrea	Mississippi	Ohio
37	George W. McKee	Kentucky	At large
38	John M. McNab	Alabama	Alabama
39	Ronald J. Mackenzie	New York	At large
40	Samuel B. Mackintire	Massachusetts	Minnesota
41	Frank Maney	Tennessee	Tennessee
42	Samuel S. Mansfield	Connecticut	At large
43	George Marchbanks	Tennessee	Tennessee
44	William A. Marye	California	California
45	Robert B. Merritt	Wisconsin	Iowa
46	Stephen A. Moreno	Florida	Florida
47	Albert M. Murray	New York	New York
48	Jasper Myers	Indiana	Indiana
49	Robert E. Noonan	Maryland	Maryland

List of officers, professors, and cadets—Continued.

No.	Names.	Where born.	Whence appointed.
50	J. Hampden Porter	Pennsylvania	Pennsylvania
51	Arthur F. Reed	Indiana	Indiana
52	James B. Reid	New York	New York
53	James Riddle	Pennsylvania	Pennsylvania
54	Kenelan Robbins	Massachusetts	Massachusetts
55	James H. Rollins	Missouri	Missouri
56	Ebenezer McE. Ross	Tennessee	Tennessee
57	E. Kirby Russell	New York	At large
58	James A. Sanderson	Ohio	Ohio
59	James M. Sanno	New Jersey	New Jersey
60	Armand Selby	Louisiana	Louisiana
61	Oliver J. Simmes	Virginia	Alabama
62	Morris Shaff	Ohio	Ohio
63	John W. Shrewsbury	Indiana	Indiana
64	Jared A. Smith	Maine	Maine
65	Charles W. Smith	Pennsylvania	Pennsylvania
66	William F. Spurgin	Kentucky	Indiana
67	Charles R. Suter	New York	At large
68	Horace D. Tuyman	Virginia	Virginia
69	Singleton Van Buren	South Carolina	At large
70	Joseph W. Vance	Illinois	Illinois
71	John A. West	Georgia	Georgia
72	Henry S. Wetmore	New Hampshire	Ohio
73	Henry C. Wharton	Arkansas	Nebraska
74	J. Eveleth Wilson	District of Columbia	At large

RICHARD DELAFIELD,
Col. of Engs. U. S. A., and Sup't of the Military Academy.

HEADQUARTERS MILITARY ACADEMY,
West Point, New York, September 30, 1858.

Report of the Board of Visitors to the United States Military Academy at West Point.

UNITED STATES MILITARY ACADEMY,
West Point, New York, June 13, 1858.

SIR: The Board of Visitors appointed to attend the annual examination of the Military Academy at West Point have the honor of submitting the following report:

On the first day of June, 1858, the undersigned assembled at this place, and on the following day proceeded to an organization for the transaction of business. The president of the board appointed special committees to examine into the actual state of discipline, instruction, police, administration, fiscal affairs, and other concerns of the institution, and the result of such examination, made known at the several meetings of the board, is embodied under the different topics of this report.

INSTRUCTION.

The board devoted six hours each day during their session to attending the examination of the cadets. The first or graduating class was examined in engineering, civil and military, in ethics and moral philosophy, in constitutional and international law, in chemistry, mineralogy, and geology, in infantry, cavalry, and artillery tactics. With the result of the examination of this class the board were entirely satisfied. The promptness, intelligence, and skill evinced by the members of this class furnished conclusive evidence of the excellent intellectual training to which the students at this institution are subject. The examination of the first class having been completed, the academic corps and the Board of Visitors proceeded with the examination of the several other classes of cadets. The board cannot repress the expression of profound admiration of the examination in philosophy and mathematics. The proficiency of the cadets in these most important branches of military education furnished gratifying proof of the fidelity with which the distinguished professors of these subjects had discharged their duties, as well as of the great industry and intelligence of the cadets. In each department of this wide subject the knowledge evinced was thorough and exact. The ability and great experience of Professors Bartlett and Church, the instructors in natural philosophy and mathematics, have rendered their respective courses, theoretically and practically, as perfect as possible to make any similar course of instruction. In chemistry, drawing, Spanish, painting, French, rhetoric, elocution, and logic, the examinations afforded evidences of very creditable attainments upon the part of the cadets. The examinations in each of these studies were thorough, and of a character well calculated to ascertain the proficiency of the student in each branch or department of study.

Among the most interesting exercises of a thoroughly practical character were those in the use of the bayonet and sword. They have recently been introduced, and promise to be of great utility in the service, as the use of these weapons will be taught by the graduates of this institution to the infantry and dragoons of the regular army. It affords the board much pleasure to award to the academic board great praise for the admirable and thorough manner in which the examinations were conducted of the several classes of cadets, as well as for their uniform courtesy towards the whole corps of cadets during the progress of the examinations. The cavalry, artillery, and infantry exercises of the cadets were of daily occurrence during the sessions of the board, and afforded great satisfaction. Nothing can be more perfect, striking, and beautiful, than the exercises of the infantry in the system of tactics introduced by the present commandant at this point. There are no soldiers in the world who perform their military exercises with more beauty and skill than the cadets at this institution. Daily opportunities were afforded the board, during the afternoon drills, of observing the effect of the admirable instruction which the cadets received during the whole period of their service here in military tactics. There should, in our opinion, be an appropriation of $10,000 made for the purchase of new cavalry horses for the use of the cadets. The horses now here are employed indiscriminately for artillery and cavalry exercises, and many of them are old and almost worthless. Some of the horses have become dangerous from decrepitude and old age, and as the cavalry exercises are conducted in the hall of the riding school, accidents arising from the worthlessness of many of these horses might result in the serious and permanent injury of the cadets.

We regard the present course of instruction in ethics, rhetoric, logic, history, and literature, as sufficiently extensive, and it would be difficult, in our opinion, to make any material addition to the course without trenching upon other and more important departments of study. Besides discharging diligently and faithfully the responsible duties of chaplain and religious instructor, the present professor of ethics, logic, history, and literature, is also required to teach constitutional and international law, and, under the provisions of the five years' system, will also teach the law and evidence of courts-martial. In institutions where these subjects are well taught they are usually assigned to no less than three professors, who are usually men of profound legal attainments. We therefore recommend the creation of a new professorship, viz: that of constitutional and international law, and of the law of courts-martial. It would not be injudicious to appoint to the new professorship some gentleman familiar, by early education and experience, with all that pertains to these subjects.

The experience of the world is eminently favorable to the employment of jurists, rather than clergymen, to teach the rudiments of law, and we are not advised of any other instance than that of the chaplain of this institution where the subjects of constitutional and international law, as well as of the law of courts-martial, are entrusted to the clergy.

ARTILLERY.

In inspecting the military organization of the Academy, the board have been impressed with the importance of selecting, as instructors in the several military departments, those officers, exclusively, who belong to the particular arm of the service whose duties they are called upon to teach. Thus, for example, and more especially in the department of artillery—a corps regarded in all other armies, save our own, as second only to that of the engineers—we would suggest, as a modification of the instruction at the Academy, that the subject should be taught by artillery officers alone; that the theory and practice should be more intimately blended by requiring instruction to be given by those who are equally experienced in both. We present great inducements for efficiency in any department by placing it under an officer whose pride in his particular arm will always urge him to make the system as perfect as possible. And, in this view, we deem it advisable that the corps of artillery, so efficient a branch of our military system, should be adequately represented at the academic board by instructors selected as above mentioned, who may there exercise the influence and force necessary for that department.

CIVIL AND MILITARY ENGINEERING.

The result of the examination on the subject of military and civil engineering was entirely satisfactory to the board. Although most thorough and searching, the members of the graduating class evinced exceedingly creditable and praiseworthy familiarity with this most important and essential department of military education. The board have only to regret that the present *programme* of studies at West Point does not allow sufficient time to the study of the theory and practice of civil and military engineering. The present very able and experienced professor in this department and his assistants are required to teach a course of studies which, in all the principal military schools of Europe, is assigned to four distinct professorships in each military school. We are convinced that the text-books, lectures, illustrations, models, architectural designs, maps, &c., used by the instructors in this department, are admirably adapted to the necessities and requirements of military and civil engineering in this country. The principal text-book of the course, although the work of a distinguished American (Professor Mahan) is one of the best known to the profession. Endorsed by the most distinguished civil and military engineers of the age; adopted, as a text-book, in this country and abroad, into many of the principal universities and military schools; translated into several of the languages of Europe; the leading work from which the engineers of our own army have obtained their stores of valuable knowledge, it is, above all others, the volume best suited for this institution. Our attention was also particularly directed to the happy and admirable adaptation of the

whole course of instruction in this department to the wants, characteristics, and physical peculiarities of military and civil engineering in this country. Whilst the great European authorities upon the subject of engineering are very properly not ignored in this department, nor the student denied the advantage which must arise from the study of the works of eminent English, German, and French engineers, the utmost care is taken to familiarize the student with all that relates peculiarly to American engineering. In the principal text-book of the course we find particular and most minute information respecting American building materials for forts and all other public works, such as American stone, timber, metals, mortars, cements, &c., and also as to American bridges, roads, masonry, fortifications, railroads, canals, rivers, and seacoast fortifications. In the "section rooms," or "halls of instruction," for the classes in engineering, we are pleased to observe plans, models, and drawings of all the great architectural triumphs of American military and civil engineering.

The board, after the most careful and thorough examination of the whole course of instruction in civil and military engineering at this institution, are entirely satisfied, and unanimously of the opinion that it meets every requirement of the service, and reflects eminent credit upon the distinguished professor who has trained for the army so many young and accomplished engineers, of whom the nation is justly proud. Meeting, as it does, the highest approval of distinguished and experienced engineers and veteran officers of the army, who have tested its efficiency in war and in peace, we give to it our most cordial and unqualified approval.

ASSISTANT PROFESSORS.

The attention of the board was particularly attracted to the present method of appointment of assistant professors.

The comparative smallness of the corps of permanent professors, and the great importance of the subjects of education intrusted to their care, renders the method of selecting the assistant professors a matter of great importance in many points of view. Although the labors of the assistant professors are carefully supervised by their principals, yet the qualifications of the adjunct professors should be of the highest order. Facility in imparting instruction, familiarity with the studies of their departments, and experience in giving information, are essentially necessary to the teacher. These essentials are, in our opinion, not attained by the present system of appointing assistant professors. Without consultation with the members of the permanent academic staff, and frequently without the slightest inquiry respecting their qualifications, officers of the army are assigned duties at this institution as assistant professors; not only are they required to act as assistant professors, but they are also allowed, by the rules of the service, too short a time at this place to acquire the necessary information and experience to render them useful and efficient instructors.

The department, in our opinion, before assigning an officer to the duties and responsibilities of the post of assistant professor, should ascertain that he is perfectly familiar with the subject-matter of the studies of his course. The inquiry should be as to the *speciality* of the officer. His duties should be made congenial to his favorite subjects of study. He should bring to the discharge of the duties of his chair that devotion to science and enthusiasm in pursuit of knowledge without which the teacher is never efficient. This applies more particularly to the claims of military and civil engineering, natural philosophy, chemistry, geology, mineralogy, and ethics. Great respect should, in making the selection of assistant professor, be paid to the wishes and preferences of the distinguished resident professors. They are necessarily the best possible judges of the qualifications and attainments of the graduates from this institution. The officers of the army have passed in review before them for many years past. They are also vitally interested in the selection of able assistants. Their own reputation, to no small extent, depends upon the faithfulness and intelligence of their assistants, and their own labors are materially diminished by those of competent adjunct professors.

Nothing can, we respectfully submit, be more injurious to the interests of the country and the Military Academy than the frequent changes in the *personnel* of the assistant professors, especially so whilst the present policy of appointment prevails, which seems to have not the slightest reference to the attainments and qualifications of the assistant professors as instructors of youth.

An officer, for instance, graduates at this institution, and, after four months' furlough, is ordered to the frontier, where he spends five or six years, with no opportunities or incentives to scientific or intellectual improvement. His recollection of the elementary instruction which he received at West Point becomes each year more shadowy and indistinct. Neither the society nor the demands of the service in New Mexico or Washington Territory tempt the young officer to pursue his mathematical and philosophical and ethical studies. He is, however, under the existing policy of the department, liable at any moment to be assigned to duty as assistant instructor at West Point. Unless a person of unusual talents and prodigious memory, he returns to the Academy not half as familiar with the studies of the institution as when he left it as a young graduate. Years must necessarily elapse before he can master the details of the subjects of instruction intrusted to his care. He is required to teach what, in point of fact, he does not know, and to instruct where he needs instruction. He is therefore not unfrequently an *incubus*, rather than an assistant of the principal professor. His own information is obtained by cramming, and is too crude to be valuable to his pupils. By the present system, when the assistant professor has, by intense application, overcome the disadvantages under which he labors when appointed, and begins to be useful and valuable to the Academy, he is ordered away to some other post, and his place supplied by some officer fresh from the rough service of the frontier. When it is recollected that the cadets of the junior classes, youths of slender acquirements, requiring the most

careful and patient instruction, are taught mainly by the assistant professors, the evils of the existing system and the necessity of some such modifications as those recommended by the board must be evident to those familiar with the system of instruction at this institution. We have also made many inquiries, and feel assured that our views meet with the cordial approval of those possessing the largest experience and most intelligent appreciation of the wants of the institution.

APPOINTMENT OF CADETS.

The attention of this, as of many former boards, was directed to the fact that of the eighty or ninety new cadets who are annually admitted at this institution, rarely more than one-third graduate. The government, in consequence of the difference between the number of admissions and graduates, incurs annually a large and utterly unnecessary expense in the maintenance of young gentlemen who, after one or two years spent at the Military Academy, are either dismissed or required to resign in consequence of alleged incapacity to master the course of studies designed to prepare them for military usefulness to the country. How to relieve the government of this annual expenditure, from which no advantage is derived, and also how to avoid the mortification which the failure of so large a number of young men carries home to so many families and friends in every section of the Union, are subjects well deserving consideration and attention.

A very large majority of the cadets who fail to graduate are not dismissed for misconduct in the violation of the laws for the government of the Academy. Those who cannot maintain a respectable standing in their classes, and have from failures at recitation received the fatal number of demerits, are required to leave. Mental incapacity and ignorance, which is the result of poverty and neglect in early youth, are not crimes, although their effects are, at an institution of learning like this, classed amongst offences. The present method of appointment secures for West Point a large and never-failing supply of the material out of which such "offences" are made. A wise discretion is rarely, if ever, exercised in the nomination of cadets for appointment by the President. Inquiries are seldom made respecting the talents, education, and peculiar mental fitness of those who are nominated. Personal friendship, and, still more frequently, political consideration, control those who possess the power of nomination for appointment. Hence it happens that a large number of the new cadets have not the requisite qualifications for success at this or at any other college in the Union, where graduation is not a matter of course after the payment of fees for matriculation. Many candidates for admission present themselves who are ignorant of the elements of education. We desire merely, in general terms, to recommend some change in the existing system, leaving to more able and experienced men to work out the desired reform. The field from which to select cadets should be enlarged by allowing a larger number of candidates for admission than are now allowed by law.

The controlling object of the government should be to invite competition among the youths of each congressional district for these prizes. When a vacancy occurs in a congressional district, no boy ambitious of obtaining the appointment of cadet should be denied the privilege of becoming a candidate for admission. The present "close borough" method of nomination has no reference to the talents or merits of the youth who receives the appointment. The people would feel that they had a substantial, tangible interest in the success of this military school did the father of every promising boy know that his son, if superior to his competitors, would win the prize of an honorable position in the army. The prejudices now existing against West Point in many sections of the republic would disappear if it should cease to be an institution where the power of nomination is entirely in the hands of politicians.

It is the boast of our government that it fosters talent and invites competition for all offices of the republic. As far as the selection of officers for the army is concerned, there is no truth in this theory. There is no fair and full competition for the cadet appointments. There is no reference, in the large majority of instances, to the intelligence and merits of the new cadets. We are far behind governments less liberal and democratic than our own in the method of appointing cadets for the army.

The sagacity and military experience of other countries have long since taught them the importance of securing, by generous competition, the very best talent for the army. Cadets are in many countries of Europe selected from a number of candidates—the selection always falling on the most talented and promising youths. In France, for instance, where the first military schools of the world exist, there is no favoritism exercised in the appointment of cadets to the military schools. In one of the States of this Union a normal school modelled after West Point, the superintendent and professors at which are graduates of West Point, has been for nearly twenty years in successful existence, where a Board of Visitors annually select from several hundred applicants for admission those best qualified to repay the State for the money expended on their education.

The result of this course, if pursued at this institution, would be the selection of the ablest youths of the land for the army, without regard to their social rank, political influence, or condition in life, and the graduation of nearly all those who are annually admitted to West Point as cadets.

DISCIPLINE.

The existing regulations for the government of the institution are, in the opinion of the board, eminently calculated to produce the results aimed at. Their tendency is to prevent or punish all neglects, disorders, misbehavior, or immoralities of which the cadets may be guilty; to disallow everything to the prejudice of good order and military discipline.

In discipline, no arbitrary despotism can be exercised over the cadet. By the regulations alluded to, each month the parent or guardian of the cadet is informed of his conduct, whether the same has been meritorious or otherwise. Like information is communicated to the War Department. If punishment or reprimand has been awarded, the name of the offender, the offence, and its punishment, are also specially reported each month. If a cadet shall consider himself wronged by another, or by any officer of the Academy, he has a right to complain to the superintendent; and if the proper redress is refused, he may appeal to the War Department.

The duties of the cadet as well as those of the officers of the institution are prescribed, known, and well understood. The rights of all are protected and guarded against. Under such a system the discipline cannot be despotic.

On the whole, the board believe the system of government highly conducive to the training of the cadets in the duties of the accomplished soldier. They find a high state of discipline to exist among them. This is the best commentary on the excellency of the rules and regulations for the government of the institution, and the efficiency of the officers by whom they are enforced.

POLICE.

The police arrangements of the Academy merit the approval of the board. Every regard to the health and comfort of the cadet is exhibited that is not incompatible with the discipline of the institution.

PUBLIC BUILDINGS AND GROUNDS.

The board, after a careful survey, are pleased to express their satisfaction with the care and attention paid to the preservation, neatness, and healthy condition of the public buildings and grounds. We would, however, suggest that much embarrassment has already grown, and may continue to grow, out of the subject of assigning quarters to the different members of the academic and military staff at the Academy. The difficulty is one that involves the comfort and harmony of all parties immediately concerned; and it is most desirable that some means should be adopted by which it may be obviated. Under the existing arrangement, only a certain portion of the academic board have quarters assigned them by the superintendent, while all other officers on duty at the post choose their own quarters according to their respective army rank. In consequence of this, many junior professors and instructors of high attainments and of invaluable service to the institution are confined with their families in quarters entirely inadequate to their reasonable wants. We commend, therefore, for consideration, whether these inconveniences should be remedied by an increase of quarters, or by a change in the present method of assigning them. Whether the one or the other mode shall be adopted, we are

convinced that the subject should receive an early and practical attention.

The board would also recommend that an appropriation be made by Congress to light with gas the riding hall connected with the institution. During the short days of winter the exercises in cavalry tactics, at the close of the academic hours of study, must, on account of the darkness, be greatly neglected, unless a place other than the parade ground is provided for practical instruction. The educational wants of cadets, and, indeed, the success of the institution, require that the time now allotted to the theoretical departments should not be encroached upon; and in however an attractive form the practice may present itself as distinct from theory, experience teaches that the one should not be fostered at the expense of the other. Deeming it, then, unadvisable to limit the standing course of studies at the Academy, it is desirable that during the winter season a suitable place should be provided, where that portion of each day may be occupied in receiving practical instruction in cavalry tactics, which might not otherwise be so usefully employed.

FISCAL AFFAIRS.

In examining the fiscal affairs of the Military Academy, the board were offered every facility by the departments intrusted with the disbursement of the annual appropriations made by Congress for the benefit of the institution. The accurate and methodical system adopted by these departments is worthy of all praise, and lightened not a little the labors of the board. Everything there is constantly administered in a most praiseworthy manner, while every dollar expended is subjected to a constant watchfulness, and made to bring its full value, under the rule of economy which pervades these and other departments of the institution. If this were not so, it would be impossible to conduct such an institution so thoroughly and efficiently upon so small an annual appropriation—an appropriation exceedingly limited when compared with the variety and multiplicity of the objects dependent upon it.

The financial system pursued with the cadets—the numerous but necessary checks that are interposed in the expenditure of such moneys as may be deposited on their admission, together with their monthly pay—the requirement of keeping an accurate, systematized account of all their expenses, are most admirably calculated to secure them from imposition, while they are thus easily taught the strictest economy in the management of their funds, since they are constantly reminded by a reference to their check-books of the extent of their income and the objects to which prudence requires they should appropriate it. The habit of economy thus learned here teaches that prudence in the management of their affairs, without which, very often, all other attainments are obscured or rendered wholly useless, and without which men are but little suited for the simplicity and salutary equality which are not only taught by, but result practically

from, our institutions. The cadets, therefore, by such a system, learn lessons of order and economy that become of the utmost value to them in after life, and which have already so distinguished the graduates of this Academy, that the experiment of making them the disbursing agents of the government on its public works has been eminently successful. And it is doubtless from this cause that they present the excellent example of having disbursed millions of the public funds without a dollar's defalcation. The lessons of order and economy taught here thus render them invaluable agents of the government, and will compensate the nation even in this regard alone for the very moderate expenditure incurred in their education.

By the act of February 16, 1857, the following were the appropriations for the support of the Military Academy, viz:

For pay of officers, instructors, cadets and musicians.....	$91,106 00
Commutation of subsistence.....	2,044 00
Forage for officers' horses.....	864 00
	94,014 00
Of this amount, as appears by schedule marked A, attached to this report, there has been received from the United States on account of the cadets.....	78,605 10
Expended for their benefit from 1st May, 1857, to 1st May, 1858.....	77,758 61
Balance unexpended.....	846 49

By the same act, above alluded to, there were appropriations made for the current and ordinary expenses for the Academy for the fiscal year ending July 1, 1858...	67,165 00
Which, with balance on hand July 1, 1857.....	19,362 87
And amounts received from other sources	242 81
Make a total of.....	86,770 68
Of this there has been expended, as appears by schedule marked B, up to June 7, 1858.....	69,909 34
Leaving available for balance of fiscal year in Quartermaster's Department.....	16,861 34

The board have not deemed it necessary to submit with these tabular statements the amounts disbursed in the pay of the faculty and officers attached to the Academy, which will entirely absorb the balance of the appropriation of $91,106, made by the act of February before mentioned.

GENERAL ADMINISTRATION.

In regard to the general administration of the academy, the board feel great satisfaction in being able to bear testimony to the successful and harmonious operation of the varied departments of an institution which in its results has impressed itself so strikingly and favorably on our country. The best test, it is submitted, of the value and efficiency of any system will be found in its absolute and comparative advantages as illustrated by experience, as manifested in its ability to fulfil the objects of its creation, and by the contrast afforded in the operation of like institutions of other countries. Judged by this standard, we think that the alumni of West Point have only to point to their uniform achievements in the line of their profession to vindicate the wisdom which founded the academy, and the well-sustained discretion and scientific learning which have conspired to bring about such favorable results. We are satisfied that a code of military regulations and discipline—a scientific curriculum and a liberal and elevated economy, which, in their various ramifications, all tend to such a successful issue, should not be changed or modified merely for the sake of experiment. The board are, therefore, prepared to give their unqualified approbation to the entire system, and the manner of its administration. It is not to be inferred that in thus announcing their inability to discover defects, none exist, and that improvements may not be made. It is supposed, however, that the one or the other will be best discovered and most appropriately remedied by those whose lifetime of scientific information has been devoted to the institution, and whose pride and honor it is to be identified with its prosperity.

The board are satisfied that the auspices under which the academy is now beheld present it in its most favorable aspect, which is sufficiently accounted for when it is remembered that the distinguished and accomplished Major Delafield is the superintendent, sustained, as he is, by a corps of assistants and instructors whose capacities for the duties devolved upon them satisfies his own elevated standard. The reputation of more than one of the professors and officers at West Point has become the property of the country. It is deemed scarcely necessary to occupy space with an enumeration of the various departments made, of instruction, names and number of instructors, &c., &c. This information is annually given to the public by the War Department, and is accessible to all who take an interest in our military system. The board however, impressed to a certain extent with the propriety of views heretofore given, are satisfied that controlling reasons demand a change, and, as they think, a great advantage in one particular, and that is the elevation of the superintendent for the time being to the office of local colonel of engineers. An increase of rank to a worthy officer necessarily gives an increase of dignity in the estimation of all with whom he is thrown in official relations; a higher respect engendered and a better enforcement of authority follows; a reciprocal advancement is felt by all the subordinates; the desire of

approbation is increased in proportion to the elevation of the quarter from which it proceeds, and a corresponding efficiency in all departments ensues. More particularly, however, is this change deemed necessary from the fact that the position of superintendent necessarily involves an expenditure that, doubtless to an officer dependent on his pay, is often a source of inconvenience and annoyance.

West Point is situated near the commercial metropolis of the Union; near the great centres of travel and of trade; is a place of remarkable natural attraction; of great historical interest, and the chief institution of learning belonging to the republic, and, altogether, combines sources of intellectual pleasure hardly belonging to any other portion of the country. It is the common centre of the affections of the army. It is, or should be, neutral ground for all contestants, however asperities may exist elsewhere. A visit at the annual examination will at once disclose the great interest felt by all officers not on duty, to whom it is accessible, and who make it a point to congregate there at that period, and who avail themselves of other times of convenience to revisit it, both for the purpose of consulting the library and of reviewing familiar scenes. The house of the superintendent should, by a liberal legislation, be made the home, for the time, of those whom he would be glad to see. The dispensing of a kind hospitality in these reunions, it is thought, would have the happy effect of cultivating the kindlier feelings of those upon whose zeal and cordial co-operation in times of difficulty and trial so much depends. Besides this, distinguished men of our own and other countries are continually attracted hither; and it would be an outlay yielding large return if the commander of the post were enabled by additional rank and the consequent emo'uments, to represent to a proper extent the hospitality, as well as the military and scientific character of our country. A commander of any European post of any consequence is generally for the purpose last mentioned munificently supplied with means by his government. And it scarcely requires argument to prove what daily experience inculcates and establishes, that the social amenities of life, even when casual to the mutual participants, are often productive of lasting and beneficial results to those concerned. To a country so wealthy as ours the small expenditure involved would scarcely be estimated, and would, even if far less of good was likely to result, be amply justified. The liberality of the military profession is proverbial the world over—that of our country certainly forms no exception; and hence more than is ordinarily required in the line of hospitality is the practice. Upon one in high station the proprieties of this duty continually press, and cannot be ignored. A superintendent of West Point is selected on account of acknowledged ability and fitness; he belongs by law to the first branch of the service. His position is the reward of merit. But it necessarily entails more than ordinary outlay; consequently, if of small private means, he is rewarded by position on the one hand and punished by the obligations it imposes on the other. This ought not

to be; a remedy to a just extent, it is believed, will be found in the change suggested.

All of which is respectfully submitted.

JNO. W. DAVIS, of Indiana,
President of the Board.
FRANKLIN J. DICKMAN, of Rhode Island,
Secretary of the Board.
ANDREW C. GRAY, of Delaware,
JNO. S. WELLS, of New Hampshire,
GEORGE W. ROWLES, of Tennessee,
W. A. OWENS, of South Carolina,
R. E. GOODELL, of Illinois,
JAMES L. GLEN, of Michigan,
P. H. AYLETT, of Virginia,
J. LANCASTER BRENT, of California,
JAMES W. WALL, of New Jersey,
THOMAS C. McCREERY, of Kentucky.

A.

Statement of authorized amounts paid by the Treasurer of the United States Military Academy, exhibiting the annual total amounts, the average amounts for two months, together with the average amounts applicable for each cadet for all the articles, from May 1, 1857, to May 1, 1858.

On what account.	May and June.	July and August.	September and October.	November and December.	January and February.	March and April.	Total amount.	Average amount for two months.	Average amount applicable for each cadet for two months.	Remarks.
Band fund	$96 00	$110 66	$116 00	$114 75	$107 88	$106 00	$651 29	$108 56	$0 50	Voluntary subscription by cadets for the support of a band of musicians.
Board at mess commons	3,589 22	4,188 38	4,415 36	4,293 88	4,041 80	3,866 80	24,395 44	4,065 91	18 73	The amount charged each cadet, being pro rata and fixed by a board of officers who examine and audit the purveyor's accounts.
Washing	791 82	818 68	936 53	908 58	860 40	844 00	5.160 01	860 01	4 00	$2 per month, winter and summer.
Commissary store department	1,050 70	3,698 82	3,317 38	1,216 55	1,791 00	1,162 90	12,237 35	2,039 55	9 39	Conducted by the commissary of cadets, under the control of a board of inspectors. Articles furnished, viz: Text-books, drawing instruments, paints, &c., stationery, under garments, equipments, room furniture, &c.
Commissary clothing department	2,673 61	4,241 29	2,979 82	2,852 42	2,414 20	1,880 39	17,041 73	2,840 28	13 08	Conducted by the commissary of cadets, under the control of a board of inspectors. Articles furnished, viz: uniform clothing, citizens' clothing, and authorized military frock-coats when going on furlough.
Commissary shoemaker's department.	685 56	828 97	628 66	654 28	470 17	545 74	3,813 38	635 56	2 92	Shoes and repairs done by the contractor under the inspection of the commissary of clothing and also the board of inspectors.
Postage	1 71	25 74	27 52	7 68	30 24	33 81	126 70	21 11	09	Postage of letters and newspapers and packages by express. One newspaper allowed to each cadet.
Barber, shoe-blacking, and varnishing.	169 21	225 68	196 50	189 06	171 63	179 86	1,131 94	188 65	86	This embraces shoe-blacking, hair-cutting, varnishing accoutrements, &c.
Sundries	6 00	62 50	33 50	26 00	36 00	79 00	243 00	40 50	18	Special permissions.
Baths taken by cadets	92 70	105 88	93 30	103 02	96 46	97 70	589 06	98 17	45	A small charge for each bath, only sufficient to pay the expenses of the bathing establishment.
Dialectic Society	45 00	.....	.....	.....	.....	.....	45 00	7 50	04	Subscribed by cadets, under the control of the Superintendent of the United States Military Academy.
Iron bedstead and table fund	22 40	27 20	32 00	31 40	26 40	26 40	165 80	27 63	12	This is only charged the 5th class for their use, at 20 cents per month, for the first year only, which is applied to keep the articles in repair.

Rules and triangle fund	37 75	.....	.....	.....	.....	.....	37 75	6 29	03	A small charge annually being necessary to replace and keep them in repair.
Lithographic department	3 00	.....	.....	.....	.....	40 77	43 77	7 29	04	Charge for lithographic works, written by officers and professors to aid the instruction in their several departments.
Damages, quartermaster's department.	18 20	1 06	1 59	16 81	86	18 77	57 29	9 54	05	This embraces damages of barracks, breaking window glass, &c., paid to the quartermaster of the United States Military Academy, who then pays for the repairs.
Damages, ordnance department	19 29	14 12	16 11	22 15	30 39	19 04	121 10	20 18	09	Charge of damages of arms and accoutrements, loss of the same, &c., which reverts to the United States.
Damages at mess commons	.....	22 93	20 71	17 44	22 34	11 87	95 29	15 88	07	Charge of damages for tumblers, plates, dishes, knives and forks, which is signed by the cadets when the said damages are done, agreeably to the regulations of the mess commons.
Making fires and policing barracks	188 16	204 90	262 73	296 12	295 41	293 29	1,540 61	256 76	1 18	Distributing fuel, policing barracks, attendance on furnaces. The amount arranged at each settlement according to the number of cadets at muster.
Gas for cadets	.....	.....	.....	.....	308 40	268 38	576 78	96 14	1 30	Being the amount not exceeding the former expense of light by oil.
Dentist	35 45	31 25	.....	83 99	41 50	27 50	219 69	36 61	12	For professional services when recommended by the army surgeon of the United States Military Academy.
Dancing master and cotillion parties.	169 21	455 16	.....	.....	.....	.....	624 86	104 14	47	Amount subscribed by the cadets of the Military Academy, this being a voluntary subscription.
Monument to the memory of deceased cadets.	.....	99 99	133 32	163 59	168 24	161 46	726 60	121 10	56	Voluntary subscription for the erection of two monuments by the classmates of the deceased cadets.
Cash on account, and for sundry subscriptions.	626 53	208 96	68 44	23 38	63 89	104 26	1,095 46	182 57	84	Subscription for newspapers, magazines, &c.
Balances paid cadets	4,821 04	347 89	95 84	297 62	345 32	111 00	7,018 71	1,169 78	5 38	When graduating they receive the balances due them, including their equipment fund; and the furlough-class cadets receive the balance that may be due them to the 1st of July.
Total amount	15,142 55	15,720 56	13,375 31	11,318 72	12,322 53	9,878 94	77,758 61	12,959 71	60 49	

The amount received from the government of the United States, from May 1, 1857, to May 1, 1858, on account of cadets	$78,605 10
Amount deposited by cadets admitted in June and September, 1857	4,442 02
Total amount	83,047 12
Average for two months	13,841 18
The average number of cadets from May 1, 1857, to May 1, 1858, is 217. The average amount applicable for each cadet, for two months, is	63 78
From which deduct the amount disbursed from May 1, 1857, to May 1, 1858	60 49
Average balance in favor of cadet	3 29

MILITARY ACADEMY, *West Point, June* 10, 1858.

RICHARD DELAFIELD,
Major of Engineers, Supt. Military Academy.

B.

Statement of funds available, and disbursements made by the Superintendent of the United States Military Academy, during the fiscal year ending June 30, 1858.

Heads of appropriation.	Appropriation available July 1, 1857, for the fiscal year ending June 30, 1858.	Received during the year from other sources.	Total available for the fiscal year ending June 30, 1858.	Expended to June 7, 1858.	Available for balance of the fiscal year.
Current and ordinary expenses	$38,326 73	°$222 56	$38,549 29	$35,281 93	$3,267 36
Gradual increase and expense of the library	1,597 47	.....	1,597 46	1,032 35	565 11
Expenses of the Board of Visitors	4,678 50	.....	4,678 50	.....	4,678 50
Forage for artillery and cavalry horses	9,160 07	.....	9,160 07	8,065 06	1,095 01
Replacing dead and worn out horses	44 91	†20 25	65 16	.....	65 16
Supplying horses for cavalry and artillery practice	1,000 00	.....	1,000 00	.....	1,000 00
Apparatus for warming buildings	1,249 04	.....	1,249 04	1,231 05	17 99
Furniture for hospital for cadets	250 00	.....	250 00	36 22	213 78
Barracks for dragoon detachment	5,000 00	.....	5,000 00	5,000 00	.....
Purchase of bell, and mounting the same, &c.	800 00	.....	800 00	721 61	78 39
Gun pendulum	170 75	.....	170 75	.....	170 75
Balistic apparatus	500 00	.....	500 00	.....	500 00
Repairs to officers' quarters	500 00	.....	500 00	439 31	60 69
Models for the department of cavalry	1,000 00	.....	1,000 00	916 88	83 12
Extension of water pipes, and increase of reservoir	2,000 00	.....	2,000 00	.....	2,000 00
Targets and batteries for artillery exercise	200 00	.....	200 00	43 00	157 00
Gas pipes, gasometers, and retorts	7,500 00	.....	7,500 00	7,296 33	203 67
New equatorial telescope	426 32	.....	426 32	148 35	277 97
Erecting barracks for engineer troops	10,000 00	.....	10,000 00	7,690 85	2,309 15
Public clock	700 00	.....	700 00	700 00	.....
Stables for dragoon and artillery horses	1,424 09	.....	1,424 09	1,306 40	117 69
	86,527 87	242 81	86,770 68	69,909 34	16,861 34

° From sale of old brass and iron	$77 38
Do. of old rope	6 30
Do. of yoke worn out oxen	138 88
	222 56
† From sale of old horse	$20 25

RICHARD DELAFIELD,
Major of Engineers, Superintendent Military Academy.

UNITED STATES MILITARY ACADEMY, *West Point, N. Y., June* 8, 1858.

RIVERS AND HARBORS, ETC.

Operations have been prosecuted on but few of the works of river and harbor improvement under the charge of this department for want of means; the most important of those for which funds existed have been carried on with gratifying success, as will be seen by reference to the subjoined special reports.

For the progress made on the Washington aqueduct, I beg leave to refer to the report of the officer in charge of that work, appended hereto.

Deepening the channel of the Patapsco river, in charge of Major H. Brewerton.—Operations were continued until the 24th of February, when the ice became so thick in the river as to make it necessary to suspend operations and tow the dredgers into harbor for safety. Advantage was taken of this suspension of work to overhaul and thoroughly repair the machinery of the boats, &c., and caulk the scows. Two of the dredges resumed operations on the river on the 25th of March, and the other two on the 29th of the same month. The quantity of matter removed from the line of the new channel by the United States dredges from October 1, 1857, to June 30, 1858, is 235,410 cubic yards. The channel is now available for vessels drawing about 20 feet of water, and on the 7th of this month one of the largest ships (Empress of the Seas) that has ever been in the port of Baltimore was brought up to the city through the new channel, the ship drawing 19½ feet of water at the time, with the tide 14 inches above ordinary low water. The vessel could, no doubt, have been carried through the new channel with a draught of 21 feet, as there were no indications that the ship's keel was near the bottom. It is very desirable that the channel should be dredged out to the depth and width contemplated as early as practicable, that it may be made available for the largest class of vessels frequenting the port, and for this purpose $100,000 is asked to be appropriated for the next fiscal year. In consequence of the available means for this improvement being exhausted, the work must be suspended in the month of September.

Removing obstructions at the mouth of the Susquehanna river, near Havre de Grace, in charge of Major H. Brewerton.—For the reasons stated in the last annual report, no progress has been made in removing the obstructions at the mouth of this river; but as the machinery belonging to the Patapsco river improvement has become availabe since September, it is intended to employ the United States steam dredges and the steam-tug in removing those obstructions.

No further appropriation is asked.

Appomattox river improvement.—The operations on this river, consisting of dredging the channel way, have been prosecuted under a contract with the city of Petersburg to the extent of the remaining balance of the appropriation, the final payment having been made September 22, 1858.

Removal of obstructions from Savannah river, below the city of Savannah, placed there during the revolutionary war for the common defence, in charge of Captain J. F. Gilmer.—The deflecting work above King's island has been completed, and the required effect obtained of an increased flow down Front river.

The dredge-boat has been employed in removing the shoals at the wharves and near the wreck bank. During the past summer the dredge has cleared the channel through the "knoll" off Cockspur island, the expenses of which work have been paid by the city of Savannah.

It is confidently expected that during the coming year, by the application of the remaining funds, a continuous channel of at least 12′ low water will be obtained from the bar to the city.

Balance in treasury, October 1, 1858.....	$39,798 91
Probable amount to be expended by June 30, 1859.....	39,798 91

Improvement of the River St. John's, Fla., in charge of Lieutenant W. H. C. Whiting.—A contract was made for maintaining for the period of ten months a depth of water suitable to the class of vessels engaged in trading to Jacksonville. Nothing was done by the contractor, nor is it probable that for the amount remaining on hand anything permanent can be performed.

Repairs of sea-wall at St. Augustine, Fla., in charge of Lieutenant W. H. C. Whiting.—Nothing has been done to this work during the past year. It requires no further immediate expenditure.

S. THAYER,
Brevet Col. Commanding Corps of Engineers.

WASHINGTON AQUEDUCT.

Annual report of operations during the year ending September 30, 1858.

At the date of the last annual report, September 30, 1857, the condition of the work was as follows:

The right of way from the Great Falls, through the State of Maryland, to the District line, and in the District of Columbia for about one-half the distance from the District line to the distributing reservoir, had been acquired. All the culverts in Maryland had been completed, or were nearly finished, and one had been built in the District. Bridges Nos. 1 and 2 were well advanced, and the preparatory works for Nos. 3 and 4 were finished.

All the embankments and excavations over ravines in Maryland had been brought to within a foot or two of grade.

6,104 lineal feet of masonry conduit had been completed.

2,034½ feet of tunnels had been excavated.

A good equipment of boarding-houses, stables, storehouses, scows, tools and machinery, suited to the construction of the work, had been

provided; and it was expected that if a sufficient appropriation was granted by Congress the water from the Little Falls branch might be introduced during the present year.

During the session Congress passed a law providing for condemning lands within the District of Columbia needed for the aqueduct, and, the necessary legal steps having been taken, the right of way for the remainder of the aqueduct has been acquired.

At the Great Falls of the Potomac the necessary lands for the construction of the dam had been long before acquired, both on the Maryland and Virginia shores; but a tract of a few acres, upon a barren island which lay in the route of the dam across the river, had never been acquired by the United States, owing to the refusal of the proprietors to sell it at what was considered a reasonable price.

An attempt was made during the past season to acquire this land by condemnation, under the Maryland law, but the verdict rendered was so high, $150,000, that it was not considered proper to accept it, and the case will be tried before the court which sits in November, to ratify or reject the verdict of the jury. A map of the Great Falls accompanies this report.

During the winter of 1857 a large force was employed upon the aqueduct, and the season proving a favorable one, great progress was made in the graduation of the work in the District, and the collection of materials for the construction of the masonry generally. Stone was quarried and piled along the route, ready for use in the spring, it having been determined to substitute stone masonry for brick work in the greater part of the conduit.

The appropriation made by Congress, though not quite so large as asked, has been sufficient to keep the work in full activity.

Proposals for the completion of the work had been invited, by an advertisement, before the adjournment of Congress, and at the letting, on the 11th May last, a large number of bids were received.

Upon examination and comparison of the bids, the following, appearing to be the lowest which complied with the terms of the advertisement and specifications, were recommended to the Secretary of War for acceptance:

1. Rip-Rap dam at Great Falls.—Dexter Belknap.
2. Masonry at conduit head.—Farwell, Case & Estabrook.
3. Gate-house at Great Falls.—Farwell, Case & Estabrook.
4. Connexion between gate-house and tunnel No. 1.—Johnson & Coats.
5. Waste-weir at tunnel No. 1.—Derby, Dodson & Co.
6. Conduit between tunnels Nos. 1 and 2.—Farwell, Case & Estabrook.
7. Completion of bridge No. 3.—A. A. McGaffey.
8. Graduation of sections Nos. 9 and 10.—Decker & Wheaton.
9. Completion of bridge No. 4.—Robert McIntyre.
10. Waste-weir in tunnel No. 4.—P. Crowley.
11. Effluent gate-house and sluice gate-house of receiving reservoir.—H. L. Gallaher.
12. Effluent water-gate and hoisting crab.—Murray & Hazlehurst.
13. Waste-weir between the two reservoirs.—Carman & Dobbins.

14. Gate-houses and other masonry structures about the distributing reservoir.—Farwell, Case & Estabrook.
15. Distributing reservoir.—A. A. McGaffey.
16. Conduit under bank of distributing reservoir.—A. A. McGaffey.
17. Masonry of bridge No. 5.—James Roach.
18. Iron and wood-work of bridge No. 5.—J. Hutchinson.
19. Pipe-wall at Foundry branch.—Decker & Wheaton.
20. Masonry of bridge No. 6.—Carman & Dobbins.
21. Iron and wood-work of bridge No. 6.—Daniel Stone.
22. High service reservoir.—Decker & Wheaton.
23. Pumping engine.—H. R. Worthington.
24. Cast-iron pipes.—Lawrence Myers
25. Stopcocks.—Asahel Sylvester.
26. Laying cast-iron mains.—A. A. McGaffey.
27. Sand.—R. F. Jackson, part. H. C. Mitchell, part.
28. Hydraulic cement.—C. H. Locher, part. Newark Lime and Cement Company, part.

This recommendation was approved by the Secretary of War, except as to cement; and the parties were notified accordingly.

All the parties to whom the contracts were thus awarded entered into contract, except Messrs. Johnson & Coats; Derby, Dodson & Co., and Daniel Stone.

A contract for the iron and wood-work of bridge No. 6 was, upon Mr. Stone's declining to enter into bond, made with Messrs. A. & W. Denmead & Sons, the next lowest bidders.

Copies of these contracts accompany this report.

The work under these contracts and under those reported last year has been carried on during the year, generally with energy and success.

The dam at the Great Falls, which had been commenced last year, having been carried as far as was possible before obtaining title to the land on the island, work upon it has been suspended for the present.

The masonry at the conduit head has been put in such a state as to be safe for the winter, and the work suspended until next season; other works of more immediate importance consuming all the dimension stone we were able to obtain from the contractor at the Seneca quarry.

The gate-house at the Great Falls has been built, the gates placed, and the brick covering arches turned. It is now in condition for use, and requires only the ashlar facing of the superstructure to complete it.

Upon the failure of the successful bidders for the connexion between the gate-house and tunnel No. 1 to enter into contract, it was determined to excavate this work as a cut, instead of tunneling it. Part of it has been completed and arched over, and the remainder will probably be completed during the winter.

Tunnel No. 1, 1,438 feet long, through a very hard rock and at too great a depth to make it possible to hasten the work by means of shafts, will still require from nine to twelve months for completion. All the other tunnels are completed, excepting No. 3, in which about two months' work remains.

The masonry conduit has been carried on by the contractors with great energy; 41,269 lineal feet, or $7\frac{8}{10}$ miles, containing fifty thousand cubic yards of masonry, having been completed since the last annual report. This work is now in such a condition that I have no doubt of the completion of the entire conduit, from the Great Falls to the distributing reservoir, by the first of December next.

All the culverts are completed.

Bridges Nos. 1 and 2 require only the roofing slabs, being now in such a condition as would allow the water to be passed through them; No. 3 will be as far advanced before the winter sets in.

At bridge No. 4 the work was begun by the contractor, Mr. McIntyre, and carried on efficiently until he was interrupted by the failure of Messrs. Frederick & Fields to supply the granite voussoirs according to the contract made with them last year. They were to supply the whole of these voussoirs, containing some thirty thousand cubic feet of granite, by the 30th June, and, relying upon the fulfilment of this contract, Contractor McIntyre went to work. Many of the blocks have not yet been delivered, and great delay of the work and loss to the contractor has been the consequence.

It is expected, however, that the granite will be delivered in time to complete the setting and keying of the granite arch this season, and during the winter stone will be quarried, so as to permit the completion of the bridge in the course of next season.

The contractor for the masonry of bridge No. 5 having failed when called upon to begin that work, his contract was declared forfeited, and the work will probably be completed this fall by day's work.

The iron superstructure of this bridge is nearly ready to put up; one line of pipes will be in place this season.

At bridge No. 6 (the crossing of Rock creek) the foundations have been laid and the masonry begun, but delay in the supply of stone from the Seneca quarry will prevent the work being completed by the 1st of December, according to the contract.

Messrs. Denmead are engaged in preparing the iron superstructure, and in order to permit the early introduction of water a line of twelve-inch pipes will be temporarily laid across the creek, resting upon the piles driven to support the centre of the bridge.

Waste-weir No. 1, at the lower end of the first tunnel, is completed and ready for use. It is designed to prevent too much water passing down the conduit, and also to supply the Chesapeake and Ohio canal with water, as required by the agreement with that company.

The waste-weir in tunnel No. 4, designed to prevent any injury to the conduit by a sudden rise or flood in the stream emptying into the receiving reservoir, is being excavated by Contractor Crowley. It is about one-third finished, and will be completed by the time bridge No. 4 and tunnel No. 1 can be made ready for the introduction of water from the Great Falls.

The receiving reservoir has been entirely completed by Contractor Stone.

After the plans of this reservoir were completed and the contracts made, a sudden and violent flood in the Little Falls branch, which flows through the valley in which the reservoir is constructed, showed

a greater volume of water than any of which I had found a record. It became necessary to increase the width of the rock cut through which the flood waters escape from the reservoir, and to increase also the height of the embankment which closes the valley. This has considerably increased the cost of this reservoir above that estimated when the contracts were closed.

The work has been satisfactorily completed without accident, and the sluice through which the water of the stream had been allowed to pass under the dam was closed on the evening of the 27th of September, in order to allow the reservoir to fill.

The season having been a very dry one, the streams and springs are unusually low, and it is to be feared that the water will not rise to a sufficient height by the beginning of December to permit its introduction into the city at that time. The fall and winter rains however will fill it, and once filled, the supply, though not sufficient for a liberal use of the water, will be sufficient to afford a valuable protection in case of fires until the completion, next summer, of all the works and the introduction of the full supply from the Great Falls.

The contractor for the twelve-inch main has completed the delivery of the pipes embraced in his contract, and the greater part of them have been proved and laid; $8\frac{6}{10}$ miles of this twelve-inch pipe have been laid, extending from the distributing reservoir to the navy yard, and to the arsenal and to the observatory.

The stopcocks, which were contracted for with A. Sylvester, will be delivered this fall.

Notwithstanding the delay in the work of bridge No. 6, crossing Rock creek, it is expected that this twelve-inch line will have all its connexions, stop-cocks, &c., complete and ready for the introduction of water by the beginning of December.

The contractor for laying the cast iron mains, Mr. A. A. McGaffey, deserves credit for the efficiency, energy, and speed with which he has executed his work. The excavations in Pennsylvania avenue have been very difficult and expensive, owing to the great number of sewers met with, most of which were at such a level and of such size that in order to avoid obstructing them by passing through them, or on the other hand exposing the pipes to danger from frost by passing over them, it was necessary to pass below them. This threw a large portion of the line into deep excavation, below the level of the tide. The work, however, was accomplished, and considering the difficulty of the operation, it was accomplished in a very short time.

The contractor for the thirty-inch main, Mr. Lawrence Myers, to whom the contract had been awarded, though not absolutely the lowest bidder, on the ground that he was the only bidder who offered to deliver the whole of the pipes by the 1st of October, permitted that date to pass without delivering a single one of the four thousand tons of thirty-inch pipe embraced in his contract.

This contract was, therefore, forfeited, and arrangements promptly made with foundries in New Jersey and Pennsylvania for the whole of the pipe, on very favorable terms. The greater part of them were engaged at $37 per ton, of 2,240 lbs., while the lowest price bid at the letting of May 11 was $38 per ton.

One-half of these pipes are promised by the 1st of January, and the rest upon the opening of navigation in the spring. They will probably all be here in time to be laid before the water can be introduced from the Great Falls.

No contract having been made for the supply of cement it has been purchased as required, at the lowest prices offered, from time to time. The lowest bid received at the letting for any very large quantity was $1 24 per barrel of 300 lbs., net, delivered. Under the stimulus of competition the price soon fell, and a very large proportion of the 94,000 barrels of cement purchased during the year was delivered on the wharf at Georgetown for from $1 10 to 95 cents per barrel of 300 pounds.

At the time the contracts were made it was hoped that the appropriation of near a million of dollars made at the last session would be sufficient to entirely complete the works, but the present condition of the various works under contract shows that a further sum of $250,000 will be necessary for this purpose. This is about 10 per cent. upon the original estimate made in 1853; in regard to which estimate the following language was used in the original report.—(Senate Ex. Doc. No. 48, 32d Congress, 2d session, page 33:)

"If the work is delayed by meagre appropriations its cost will be much increased, and I hope in that case not to be held responsible for its cost above my estimate, which is based upon a steady and vigorous prosecution of the work."

Instead of being completed within three years, the work has been delayed until within the last two seasons by insufficient appropriations, having been twice entirely suspended from the failure of appropriations in 1854 and 1856. Its construction has thus been spread over seven years, from 1853 to 1859, and the cost of the engineering, superintendence, and other contingencies, has been very much increased; the salaries of engineers for seven years, instead of three, being thus chargeable to the work. The suspensions also requiring the sale and destruction of much property collected for the use of the work, and the cost of reorganizing forces upon new appropriations will account for a large portion of the increase of expenditure.

Besides the acquisition of lands for the right of way, making contracts, building of boarding-houses, stables, machinery, tools, transportation and collection of materials, &c., the principal items of work accomplished during the season are as follows:

Rock excavation	99,000 cubic yards.
Earth excavation	290,500 "
Earth embankment	260,500 "
Puddling	21,000 "
Rammed embankment	89,000 "
Loose rock embankment	4,700 "
Masonry	64,000 "
Length of tunnels excavated	2,920 lineal feet.
Conduit laid	41,269 "
Paving	4,400 square yds.
Twelve-inch iron pipes laid	$8\frac{6}{10}$ miles.
Cast iron pipes received	1,989 tons.

Sandstone quarried and boated	4,975 cubic yards.
Cut granite voussoirs	20,097 cubic feet.
Cement purchased and delivered	94,006 barrels.
Bricks purchased and delivered	3,576,801 bricks.
Sand purchased and delivered	654,039 bushels.
Bricks laid in masonry	3,547,797 bricks.

The reception, inspection, transportation, and use of all these materials have required a large force; and the quantities are large enough to show that the work has been prosecuted with energy and success.

There have been applied to the work during the year by contractors ..... 274,000 days' work,
and by persons employed by the United States upon the work ..... 212,000 "

Making a total of ..... 486,000 "
in the twelve months ending September 30.

CASH ACCOUNT.

Available September 30, 1857		$805,141 80
Appropriations of June 12, 1858:		
New appropriation	$800,000 00	
Reappropriation of balance of appropriation of 1856, for existing liabilities.	184,963 01	
		984,963 01
		1,790,104 81
Expended in the year ending September 30, 1858		1,147,972 36
Available September 30, 1858		642,132 45
Probable amount to be expended by June 30, 1859		642,132 45
Amount required for proper prosecution of the work during the year ending June 30, 1860		250,000 00

Respectfully submitted,

M. C. MEIGS,
Captain of Engineers, in charge of Washington Aqueduct.

Brevet Colonel S. THAYER,
Commanding Corps of Engineers.

WASHINGTON AQUEDUCT.

Contract for Rip-Rap dam.

Agreement between Dexter Belknap of the State of New York, of the first part, and Capt. M. C. Meigs of the Corps of United States Engineers, of the second part, acting under the authority of and for and

in behalf of the United States of America, as engineer in charge of the Washington aqueduct, *witnesseth:*

1. That the party of the first part for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary and which may not be furnished by the United States, and to do all the work in constructing and building Rip-Rap dam across the Potomac river, above the Great Falls, or so much as may be necessary to complete the same, of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate, after the first, shall be paid, unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained percentage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that purpose, and the contractor shall at all times at his own expense keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work of the average force of men, carts, &c., employed upon it

for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract that the work aforesaid shall be commenced within three days after the notification of the approval of this contract, that it shall be steadily prosecuted, without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within twenty-four months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then, on a certificate of the fact by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved percentage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States, and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss, in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed by the order of the engineer from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement, with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down, at his own expense, and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer, which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that, in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and, when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sub-let nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally,

their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this tenth day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

DEXTER BELKNAP. [SEAL.]
M. C. MEIGS. [SEAL.]
Captain of Engineers,
Chief Engineer Washington Aqueduct.

[Done in quadruplicate.]

Witness for Dexter Belknap:
A. A. McGAFFEY.
Z. W. DENHAM as to signature of Captain Meigs.

WASHINGTON AQUEDUCT.

Specifications for Rip Rap Dam, across the Potomac river, above the Great Falls.

1. The dam will be an embankment of rubble stone, with a top width of 20 feet, a slope on the upper side of one to one, and on the lower side of five to one.

2. It will be made with large stones, the spaces filled with smaller ones, so as to form a compact mass. 8½ feet from the upper slope, and laid parallel to it, there will be three feet in thickness of spalls and gravelling. Care will be taken to place on the outer surface of the bank stone sufficiently large to resist the action of high freshets.

3. All trees, stumps, and logs will be removed from the space to be occupied by the dam; and where the engineer may direct the contractor will make any excavation necessary to build the dam on the solid rock.

4. The eastern end of the dam will be connected by a cut stone dam with the head wall of the feeder. The western end terminates against a ledge of rock.

5. For thirty feet above the upper edge of the dam, all materials will be removed for a depth of four feet below the level of water in the pool, to form a boat channel, that can be used in replacing any of the stones carried away by high freshets.

6. The rock excavated in the channel, if sufficiently hard and durable, will be placed in the dam by the contractor, and will be estimated to him as rock excavation only.

7. No logs, stumps, or drift wood will be allowed to be built into the dam.

8. All trees and brush will be cut from the land flooded by the backwater of the dam, and the contractor may be required to build the brush into the back of the dam, putting it within two or three feet of the outer surface of the slope.

9. The railroad tracks, cars, and derricks, together with the

materials for tracks, &c., procured by the United States for this work, and not required elsewhere, will be placed at the service of the contractor, for his use in constructing the dam under these specifications.

10. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons, objected to by any of the division engineers, retained in the employment of the contractors. Permitting men to board or resort where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of these rules; any violation of them will be considered sufficient ground for the engineer to declare the contract void.

11. The contractor will be required to give his personal and constant attention to the work during its progress.

12. The work shall be subject to the inspection of the engineer in charge, his assistants, or such persons as he may appoint; and every facility afforded by contractors for such inspection.

13. Any work not satisfactory to the engineer will be taken down by the contractors and rebuilt at their expense.

14. *Extra work.* No allowance for extra work, beyond that specified, shall be made, except such as shall have been done by the *special written order of the engineers.* All claims for extra work must be presented to the engineer at the end of the month in which such extra work shall have been done, to be settled in the estimate of work done within that month, or they will not be considered.

15. It is expressly stipulated that, although the United States agree to furnish certain materials, yet, that if, from any cause, there should be delay or failure on the part of said United States, there shall not be any claim for damages on the part of said contractors against the United States.

16. The contractor shall clear away from the whole breadth of the aqueduct any coarse material that he may have brought upon it during the construction of his work.

Proposal.

N. B.—No bid will be considered that does not specify a price for each item.

17. The subscriber offers to contract to do all the work required to construct the Potomac dam, at the prices mentioned in the following table, and to complete the work according to the preceding specifications, and upon the terms and conditions stipulated in the contract, which he may hereafter subscribe, in the form, a copy of which has been shown to and read by him:

1	2	3	4	5	6
Clearing.	Rubble stone.	Broken stone	Gravelling.	Excavation.	Excavation.
Per acre.	Per cubic yard.	Per cubic yd.	Per cubic yd.	Per cubic yd.	Per cubic yd.
Clearing trees, brush, and logs from the space flooded by the backwater of the dam, and occupied by the dam.	Rubble stone deposited in dam, including cost of placing and packing in conformity with the specifications.	Broken stone, including cost of stone, breaking, and depositing in dam.	Gravelling, including cost of depositing in dam in accordance with specifications.	Of rock in boat channel above dam or under site of dam.	Of gravel, earth, and loose stone, as in item 5.
$50 00	$1 30	$1 00	$0 50	$1 00	$0 15

Signed by me, this tenth day of May, 1858.

DEXTER BELKNAP.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of —— in the State of ——, hereby, jointly and severally, covenant with the United States, and guaranty, in case the foregoing bid of —— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said —— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said —— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

N. B.—The within specified works shall be completed by me within one season from date of contract, provided the necessary funds be forthcoming; also, if my bid be accepted, I am prepared to commence on the work immediately.

DEXTER BELKNAP.

My address is, "Buffalo, N. Y."

Know all men by these presents, That we, Henry B. Miller and Jacob L. Barnes, of Buffalo, State of New York, are held and firmly bound unto the United States of America in the full and just sum of twenty thousand dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and

done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this tenth day of June, anno Domini one thousand eight hundred and fifty-eight. The condition of the above obligation is such that if Dexter Belknap, his heirs, executors, or administrators, do and shall well and truly execute a contract which he, the said Dexter Belknap, has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to excavate, construct, and build at his own proper cost, Rip Rap dam across Potomac river, above Great Falls, of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said Dexter Belknap, by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect; otherwise to remain in full force and virtue in law.

HENRY B. MILLER. [SEAL.]
JACOB L. BARNES. [SEAL.]

Signed, sealed, and delivered in presence of—
A. A. McGAFFEY.

UNITED STATES COMMISSIONERS' OFFICE,
June 10, 1858.

I certify that I am acquainted with Henry B. Miller and Jacob L. Barnes, of Buffalo, New York, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion sufficient sureties for the purposes mentioned in the within bond.

AURELIAN CONKLING,
Commissioner of the United States.

UNITED STATES OF AMERICA, }
Northern District of New York, } *ss.*

On the tenth day of June, anno Domini 1858, severally appeared before me Henry B. Miller and Jacob L. Barnes, and respectively made oath, each for himself, that he is worth the sum of ten thousand dollars, over and above all his just debts and liabilities.

[SEAL.] Witness my hand and the seal of the said district, the tenth of June, 1858, at the city of Buffalo.

AURELIAN CONKLING,
Clerk of the District and Commissioner of the United States.

WASHINGTON AQUEDUCT.

Agreement between Samuel Farwell, C. G. Case, and T. D. Estabrook, under the style and title of Farwell, Case & Estabrook, of the State of New York, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting under the authority of and for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

1. That the party of the first part, for and in consideration of the

matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary and which may not be furnished by the United States, and to do all the work in constructing and building gate-house at Great Falls, conduit between tunnels 1 and 2, masonry at the head of feeder at Great Falls, gate-houses and other masonry for the distributing reservoir, or so much as may be necessary to complete the same, of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge nine-tenths of the sum appearing to be due, for work performed since the preceding estimate, shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate after the first shall be paid unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed and accepted by the engineer a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained per centage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that purpose, and the contractor shall, at all times, at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work of the average force of men, carts, &c. employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract that the work aforesaid shall be commenced within three days after the notification of the approval of this contract; that it shall be steadily prosecuted, without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within twelve months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then, on a certificate of the fact by the principal assistant engineer, made to the engineer in charge, the said engineer may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising, and the reserved per centage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States, and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same, in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss, in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed, by the order of the engineer, from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who

shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer, which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made:" *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sub-let nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this tenth day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

SAMUEL FARWELL. [L. S.]
C. G. CASE, [L. S.]
T. D. ESTABROOK. [L. S.]
M. C. MEIGS, [L. S.]
Capt. Engrs., Chief Engr. Wash. Aqueduct.

[Done in quadruplicate.]

WITNESS:

As to signature of Samuel Farwell and C. G. Case—
Z. W. DENHAM.
As to T. D. Estabrook—
H. C. POTTER.
As to signature of Capt. Meigs—
WM. G. MOORE.

WASHINGTON AQUEDUCT.

Specifications for the completion of gate-house at Great Falls.

GENERAL DESCRIPTION.

1. Gate-house at Great Falls will be built of the Seneca grey sandstone, with an interior lining of brick, and covered with a slate roofing.

2. It is fully explained by the drawings.

3. This work is commenced; the pit is excavated; the timber floor is laid; the gates and greater part of the iron work are in place; part of the masonry is constructed; derricks have been erected, and the work is now in progress.

4. The derricks and machinery in use will be placed at the disposal of the contractor for the construction of this work, to be returned by him in like good order and condition as when received, ordinary wear and tear excepted. For any loss or damage he will be held responsible, and will be charged in the final settlement of his contract.

5. For any materials procured for the work, but not yet used in it, the contractor will be charged at cost.

6. *Foundation Walls.* Foundation walls will be of rock-face ashlar, with the beds and joints roughly hammer-dressed, except the stones at the stop plank grooves, which will be cut. The portion of the foundation walls into which the castings for the gates are built will be of brick, to facilitate its connexion with the iron work.

7. All the masonry will be laid in hydraulic cement mortar, and grouted.

8. The foundation walls will rest upon the rock, trimmed so as to furnish a horizontal bearing for the bottom courses, and will be well bonded to the rock, and when it is necessary, in the opinion of the engineer, secured with iron clamps.

9. The stone for masonry of foundations will be sound and durable, laid in courses not less than nine inches thick, nor less than eighteen inches bed. There will be at least one header in every eight feet, and no stone will be considered a header that does not go entirely through the wall, or to the rock against which it is built.

10. The backing of walls should be of sound, well shaped rubble stone, well bonded with the front stones.

11. The bricks in foundation walls will be laid in full beds of mortar, and well bonded with the stone work. For the manner of construction of the masonry reference is made to the general specifications herewith, and the work already done upon the gate-houses of the aqueduct.

12. *Bulkheads.*—There will be two bulkheads built with an exterior facing of brick, the interior space being filled with rubble masonry, made of small stone, the whole to be laid in cement mortar and grouted.

13. Where the bulkheads are built against the foundation walls the brick work will be well bonded with the stone work, and neatly finished where it connects with the iron work of the gates.

14. *Platform.*—A platform of seasoned white oak timber, the whole width of the gate-house, and built into the foundation walls, will extend from the entrance of feeder to the last set of gates.

15. These timbers will be bedded on the rock or underpinned with rubble masonry; they will be 12″ × 12″, except the one at the stop plank grooves, which will be 12″ × 15″, and the two immediately under the gates, which will be 12″ × 18″.

16. *Gates.*—The gates and their frames are of cast-iron; they are twenty in number, ten at each bulkhead, and are raised and lowered by lifting screws, worked with an endless screw. The guides along which the gates slide are bolted at top to a cast-iron girder, built into the bulkheads and extending entirely across the gate-house; and at bottom are let into the timber platform, and their ends securely bolted. Each lifting screw has two cast-iron guides, built into the bulkhead.

17. The endless screw gearing is framed and bolted to timbers of white oak, extending across the gate-house, and resting upon the foundation walls. These timbers are anchored to the masonry below.

18. The iron work of the gates and appurtenances is furnished by the United States; but the setting and framing will be done by the contractor, and he will also furnish the necessary timber.

19. *Stop plank.*—Stop plank will be of best white oak timber, sound and free from all knots, shakes, sap, rot, or other defects.

20. *Superstructure.*—The superstructure of the gate-house is fully explained in plans, to which reference is made, and which will be strictly followed.

21. The walls will be of gray Seneca sandstone, fine cut, and sanded on the exterior in the best style. The mouldings and architectural enrichments to be neatly and accurately cut, and worked to the profiles of the drawings, and rubbed and sanded to a fine surface.

22. The arches and dome will be of brick, covered with slates, one-quarter inch thick, with edges trimmed to form as represented, the whole laid in cement mortar.

23. The door or gate of entrance to be of cast-iron, cast in an ornamental pattern, to conform to drawings to be furnished the contractor.

24. Good and sufficient hinges and locks, as may be directed by the engineer, to be fitted and secured upon the door.

25. *Earth work.*—The earth is to be graded or embanked around the gate-house according to the plans.

26. *Puddle.*—The earth in contact with the outer walls shall be properly puddled for a thickness of at least four feet, extending from the bottom of the excavation to within one foot of the top of the substructure or base of the building.

PROPOSAL.

[N. B. No bid will be considered unless all the blanks for prices are filled.]

27. I offer to furnish all the materials not furnished by the United States, to cut and rub the stone, to lay the masonry, transport the materials to the site, set and secure properly all the iron work, gates, beams, clamps, doors, and other things necessary to complete the gate-house described in the preceding specifications, to make the puddle and embankments, and to clear away all rubbish or waste or coarse material that may have accumulated about the site, for the following prices, to wit:

28. For furnishing Seneca grey sandstone for face work, per cubic foot	$0 24
29. For furnishing rubble stone for backing, per cubic yard	1 75
30. For rough cutting stone for foundations and substructure, per superficial foot of surface cut	15
31. For fine cutting and rubbing, per superficial foot of exterior face of walls, cut fine and rubbed	65
32. For cutting and rubbing base moulding, per lineal foot	75
33. For cutting and rubbing entablature, consisting of architrave, frieze, and cornice, per lineal foot	1 00
34. For lantern on top of dome, complete	100 00
35. For cutting door mouldings, per lineal foot, fine cut and sanded	1 00
36. For slating, per square of 100 square feet	15 00
37. For cast-iron and glass vault light in lantern, per square foot	1 00
38. For concrete, including furnishing stone, per cubic yard	3 50
39. For laying stone masonry, per cubic yard	2 50
40. For laying bricks, per cubic yard	2 25
41. For cast iron doors, with hinges and locks complete, according to the drawing to be furnished, per pound	11
42. For timber in stop plank, per 1,000 feet, board measure	50 00
43. For embankment, per cubic yard	30
44. Puddling, per cubic yard, additional	15

45. The above prices include all materials not specified as furnished by the United States, all hauling, carts, machinery, tools, scaffolding,

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specifications for conduit.

1. The conduit will be circular and generally of nine feet interior diameter; it will, when of brick, generally be built of three separate four and a half inch rings of hard brick. Where it passes through ground rising as high as the intrados of the arch, the inner ring will sometimes be omitted, and the brick work reduced to nine inches.

2. In rock cuts, and other deep cuts, where suitable stone is at hand, concrete or rubble stone masonry will be substituted for brick, in whole or in part, particularly in the lower or reversed arch.

3. When the stone available is of such quality that it may be fit to use in the exterior rings or back of the arches, but not hard enough to make the inner face in contact with the water, this inner face will be lined with a four and a half inch ring of brick.

4. Proposals will be received for each kind of work, and, where stone is used, for furnishing it, both in shape and size, for masonry and for concrete.

5. The centre of the conduit at any point is the *grade* of the aqueduct at that place. The excavations and embankments will be made to the level of grade at each place of operations before the contractor for the conduit will be allowed to commence his work there. The excavation for the lower semicircle or reversed arch, however, will generally be made by the contractor for the conduit, and it will

be trimmed out but little in advance of the laying of the masonry. After a length of one hundred feet of masonry is finished, the excavation for the next one hundred feet, if of suitable material, will be placed upon the work just laid as back filling, and will be well rammed to sustain the haunches of the arch.

6. This excavation, when in earth, will be carefully made to the prescribed form of the extrados of the reversed arch; it will be evenly trimmed to receive the masonry or concrete, without waste of mortar. The quantity is one hundred and eighty-two and eight-tenths cubic yards to a chain of one hundred feet.

7. Where embankments are made in ravines, the excavation of adjacent cuts will be made by the contractors for graduation, who may be required in such places to excavate, in part, the lower semicircle. The excavation thus made will be about four feet deep, eight feet wide on top, and six feet wide on bottom, and will leave for the contractor for the conduit about eighty cubic yards to the chain, or eight-tenths of a cubic yard to each foot lineal, to be removed as trimming; such trimming will be paid for by the lineal foot. The material taken out will be used in embankment, and will be paid for as such, unless it be rock, when it will be paid for as excavation. The price for trimming is intended to cover the expense of preparing the trench for the conduit.

8. In places where the excavation above grade shall be left untouched or unfinished by the contractor for graduation, the contractor for conduit may be required to take it for the back filling for any finished conduit, and will be paid for it only as embankment; and any solid rock requiring blasting or quarrying, in such cuts, will be paid for as rock excavation. If needed for masonry or concrete, the contractor may use it, if suitable, without charge therefor, and he will be paid for his masonry or concrete as though he had furnished the stone from without the work.

9. In rock cuttings care will be taken to cut the lower semicircle as nearly as possible to the required form, and any irregularity made in blasting and quarrying will be filled with the masonry or concrete, which in such places may be required to take the place, in whole or in part, of the brick work below grade.

10. *Brick masonry in conduit.*—The bricks, at the time of laying, will be thoroughly wet. Every brick must be laid and pressed down into a full bed of mortar, which shall cover its bed and joints; and this bedding shall be done at one operation for each brick, so that no mortar need be worked in after the brick is placed. The inner edge of the joint of each course will be the least possible to admit of mortar between the bricks. The joint of mortar between each two rings will not be less than three-eighths of an inch in thickness.

11. The masonry or concrete will not be commenced at any point until the trench, trimmed and prepared, has been inspected and approved by the engineers.

12. *Stone masonry of conduit.*—This will be made of small rubble stone, none of which will exceed fourteen inches in width or depth. Each stone will be laid in a full bed of mortar, and hammered until the mortar is pressed out at the front and the joints are completely

filled. The work, when laid together, shall be water-tight; and if, upon trial, it should prove not to be so, it will be taken up and relaid by the contractor at his own expense. Its inner surface will be well plastered with a coat of cement mortar, and be floated smooth and even.

13. *Concrete.*—The stone for concrete must be hard and sound. It will be broken to pass through a two-inch ring. It must be kept free from sticks and dirt, and when mixed and laid will be rammed into a compact and water-tight mass.

14. One barrel of cement, with two and a half barrels of sand and thirty cubic feet of stone, will make a batch of concrete.

15. The materials must be all measured—the sand and cement in barrels, and the broken stone in boxes containing ten cubic feet each; which boxes will be furnished by the United States.

16. The mortar having been spread upon a bed of plank, the broken stone will be spread evenly over it, and the whole mass turned over twice, and thoroughly mixed with a hoe or shovel.

17. It will then be deposited in its place, and carefully packed to form, either by ramming or by floating, the upper or exposed surface with a straight edge.

18. The concrete and masonry of the reversed arch will average the required thickness in each place, and be estimated and paid for as of that thickness; and no allowance will be made to the contractor for filling up any excess of size in the excavation of the trench.

19. Full directions with drawings of the mode of construction, whether of brick alone or of brick, stone, or concrete, in whole or in part, in each portion of the work, will be given by the engineer from time to time, and he will be the judge as to which mode of construction is to be adopted in each portion of the work.

20. Before the centres are struck, the ground between the arch and the bank in cuts and the top of embankments over low grounds, will be well cleared of all rubbish, and such space as may be required will be filled with fine water-tight earth, and be well rammed or puddled to support the haunches of the arch.

21. *Embankment and back-filling.*—After clearing off the space between the conduits and the sides of cuts and the top of the embankments, the banks above grade will be carried up. These will, so far as practicable, be carted in and spread in layers of three inches in depth.

22. When earth is required to be rammed, it will be done (in courses not exceeding three inches in depth) with a heavy maul of iron or wood, and will be packed evenly and uniformly, to prevent uneven settlement. Where puddling is required, the earth will be spread in layers not exceeding six inches in depth, and each course will be well sprinkled with water and tramped, and then be cut through with a spade or shovel into the ground or course below, water being added as the cutting goes on, until it is worked into a stiff and cohesive mass before another course is commenced. The quantity, quality, and disposition of rammed and puddled earth will be regulated by the engineer. It will be measured, estimated, and paid for as embankment carried into

bank, to which the price affixed in the following proposal for ramming or puddling, as the case may be, will be additional.

23. No logs, trees, stumps, brushwood, roots, leaves, grass, or stones, shall be left in or admitted into any part of the embankment; and no frozen earth or clods will be admitted, except by special permission of the engineer, and then only in the outer edge of the embankment.

24. The banks, when finished, will be made smooth on the top and slopes; and when complete the soil and muck which may be reserved for this purpose will be thrown upon the top and slopes, and be trimmed to conform to them.

25. All work done under these specifications will be in all respects in strict conformity with the directions of the engineers, and any work which they may require, and which may not be specified, will be valued by the engineer in charge; and his decision shall be final and without appeal.

26. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons, objected to by the engineer, shall be retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of this rule; any violation of it will be considered sufficient ground for the engineer to declare the contract void.

27. *Mortar.*—The mortar for masonry will be made of two and a half parts, by measure, of clean, sharp, well-screened sand, to one part of cement. It will be mixed on a bed of plank, to be approved by the engineer. The mortar bed will be protected by a canvas shelter from soaking rains or drying sun.

28. The sand and cement, after being measured, will be mixed dry, and small quantities only, taken from the heap, will be mixed with water as required.

29. The time from the first wetting of the cement to the using of the mortar shall not exceed half an hour.

30. Cement will be furnished by the United States at their cement-houses on the bank of the canal, from which it will be transported by the contractor at his own cost. It will be drawn upon the written orders of the engineer, who will be the sole judge as to which depot it shall be drawn from, and shall express the same in said orders. The quantity shall not in any case exceed six hundred pounds to each thousand brick, nor three hundred pounds to each cubic yard of stone laid. Either in masonry or concrete any excess over this will be charged to the contractor, at the rate of fifty cents per hundred pounds. Any unnecessary waste of cement detected by the engineer will also be charged against the contractor at the same rate, whether the prescribed quantity be used in the work or not; and of the proper care exercised by the contractor the engineer will be the judge. The contractor will be required to provide sheds for keeping the cement at the work dry and secure from the weather, and he will also return the bags or barrels, if required, to the United States.

31. Sand will be furnished by the United States on the bank of the canal. It will be hauled by the contractor at his own cost, and deposited upon beds to be by him prepared for it, to be approved by the engineer.

It must be transported, deposited, and used without waste, and any waste will be charged to the contractor.

32. He will be required to haul sand in advance of his work, if necessary to clear the binns and landings for the reception of additional sand.

33. Bricks will be furnished by the United States, delivered upon the banks of the canal, or at some other point equally convenient, and will be transported to the work by the contractor for masonry. The landings from which they are to be taken will be designated by the engineer.

34. It is expressly stipulated that, although the United States agrees to furnish the materials above named, and will make every effort to do the same, yet that if from any cause there should be delay or failure on the part of the said United States, there shall not be any claim for damages on the part of said contractors against the United States.

35. The forms and the centers for laying the conduit will be furnished by the United States at the rate of three hundred feet of centers for each gang of not less than twelve bricklayers, but the contractor for the conduit will be required to transport them from the bank of the canal to his work, and from any one part of it where they may have been deposited or used to any other part where they may be needed; he will set them under the direction of the engineer, and he will be required to take proper care that they be not unnecessarily damaged. If damaged, they will be repaired by the United States at the expense of the contractor. He will also give due notice to the engineer of the time when he will need centers, cement, and sand, and of the quantity of each.

36. All work done under this specification will be in all respects in strict conformity with the directions of the engineer, and any work which he may require to be done, and which may not be particularly specified, will be valued by the engineer, and his decision will be final and without appeal.

37. The subscriber offers to contract to do all the work required to prepare for, lay, and embank over the conduit on section No. —, at the prices stated in the following table, and to complete the work according to the preceding specifications, and upon the terms and conditions stipulated in the contract which he may hereafter subscribe, in the form, a copy of which has been shown to and read by him.

TRIMMING FOR CONDUIT.	EXCAVATION OF SOLID ROCK.		LAYING CONDUIT.			EMBANKMENT AND BACK FILLING.		
Below grade.	Below grade.	Above grade.	Brick.	Stone.	Concrete.	Embankm'nt proper.	Ramming.	Puddling.
Per lineal foot.	Per cubic yard.	Per cubic yard.	Per M.	Per cubic yard.	Per cubic yard.	Per cubic yard.	Per cub. yard.	Per cub. yard.
Trimming the trench below grade, and preparing it for the conduit.	Excavation of solid rock found in the trench below grade.	Excavation of solid rock above grade in the cuts which may be left by the graduation contractor, and which the contractor for conduit will be required to complete.	Laying bricks in the conduit, including the transportation of cement, sand, and brick from the canal or depots to the work.	Laying stones in conduit when required, including furnishing the stone and its transportation to the work, and the transportation of cement and sand from the canal or depots to the work, and plastering the inner face	Concrete, where required, including the furnishing, transportation, and breaking of stone, and the mixing and putting in of the concrete to the required form, and transportation of cement and sand from the canal or depots to the work.	Embankment placed around and over the conduit, whether taken from the cuts or borrowed.	Ramming earth, in addition to the price paid for it as embankment.	Puddling earth, in addition to the price paid for it as embankment.
$0 35	$2 50	$1 00	$4 50	$3 00	$3 50	$0 25	$0 10	$0 20

Signed by us this tenth day of May, in the year of our Lord 1858.

SAMUEL FARWELL.
C. G. CASE.
T. D. ESTABROOK.

To Captain M. C. Meigs, United States Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that to the best of my knowledge and belief the abovenamed guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specifications for completion of the masonry at the head of the feeder of the aqueduct at Great Falls.

1. The work consists of head wall, pier, and cut stone dam, forming connexion between rubble dam and feeder arch, arranged so as to

furnish the means by stop planks and grates of controlling the flow of water into or from the aqueduct.

2. The masonry will be of cut stone, and will be founded upon solid rock which has already been cut into level offsets to receive the lower course of stone.

3. For the general style of the masonry and the manner of constructing it, reference is made to the general specifications for masonry herewith, to the work already executed, and to the drawings, which fully explain its construction.

4. The stone will be the gray Seneca sandstone, carefully selected for hardness and durability.

5. The blocks shall not be less than eighteen inches in rise, nor less than twenty-four inches wide, and will be dressed at least twelve inches back from the faces of the work. They will be thoroughly clamped and doweled together, under the direction of the engineer, with iron clamps and dowels. The headers and stretchers to be arranged as shown in the drawings.

6. The joints of this work shall not exceed a quarter of an inch in thickness for twelve inches back from the faces.

7. The coping of head wall, pier, and lower end of cut stone dam will be of well cut stone, twenty-four inches in thickness, securely bonded, clamped, and doweled, and will cover the whole area of the walls.

8. The coping of dam will conform to the drawings.

9. The grate at entrance of feeder will be of first quality sound white oak timber, free from sap, shakes, rot, or other defects, and be constructed in form and dimensions as shown by the drawings.

10. The stop planks, as shown on the drawings, will be of white oak.

11. The wing wall or retaining wall above the feeder will be of rock face masonry, in cement mortar, backed with rubble.

12. The contractor will furnish the dowels and clamps required by the engineer, and his price for laying masonry will cover the cost of these clamps and of any drilling or cutting necessary in laying them in place.

13. The work has been begun, and is now in progress; the rock has been cut and prepared to receive the lower courses of masonry; some of the masonry has been set; the grate sill is set; the ring stones for the arch and some of the cut stone for the work are cut and ready to set; stone is on the ground in the rough; derricks have been raised; railroad tracks laid, and are in use.

14. The contractor will be charged with the materials collected or prepared, but not yet used in the work, at cost.

15. The machinery, tracks, and accessory works prepared for the construction of this work will be at the disposal of the contractor, he being held responsible for their return, on completion of the work, in good condition, ordinary wear and tear excepted. Any damage or injury, or loss which they may have suffered will be charged against the contractor in the final settlement of his contract.

PROPOSAL.

[N. B —No bid will be considered unless all the blanks for prices are filled.]

16. We offer to furnish all the materials not furnished by the United States, to cut the stone, and do all the work and transportation necessary to complete the work described in the specifications herewith, in conformity to the drawings and specifications, and to the directions we may receive from time to time from the engineer or his deputy, for the following prices, viz:

17. For cutting stone for exterior facing, per superficial foot of cutting	$0 25
18. For furnishing gray Seneca sandstone for exterior facing, for coping, &c., per cubic foot	24
19. For furnishing rubble stone for backing, per cubic yard.	1 75
20. For laying stone masonry, including transportation of materials, cost of dowels, clamps, and the work necessary for their insertion, per cubic yard	2 50
21. For laying bricks in arch, per 1,000	5 00
22. For white oak timber in grate, and stop planks, per thousand feet board measure	45 00
23. For wrought iron work for rack, per pound	12

24. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, machinery, and tools not furnished by the United States, and every expense necessary to the completion of the whole work, according to the specifications and plans, and the contract which we may hereafter sign, in the form a copy of which has been shown to and read by us.

25. Signed by us this 10th day of May, 1858.

SAMUEL FARWELL,
C. G. CASE,
T. D. ESTABROOK.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the abovenamed guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification for gate-houses and other masonry for the distributing reservoir.

1. Connected with the distributing reservoir will be the—
   Influent gate-house and end of reservoir;
   Effluent screen well and pipe vault;
   Auxiliary pipe vault;
   Culvert through division bank; and
   Drain over conduit.

All which will be explained by the drawings. During the construction full working drawings of details will be furnished by the engineer.

2. The *excavations for foundations* will be made by the contractor for the reservoir.

3. For the details of the *masonry* not specially described here, the general specifications for masonry are referred to.

4. For the *superstructure* of gate-houses the stone must be cut smooth and sanded, to lay three-eighths of an inch joint.

5. All coping and cornice to be clamped with cast-iron dowels, furnished by the United States.

6. The domes and the backing of cut stone in superstructure to be of brick.

7. The roofs will be covered with slate one-quarter of an inch thick, with edges cut to pattern, and laid in cement mortar.

8. *Centering.*—The conduit and culvert centres in this work will be furnished by the United States. All others by the contractor.

9. Patent vault lights and frames, as well as any iron or timber furnished by the United States, will be built into the work by the contractor, as directed by the engineer.

10. The floor will be of sound Carolina yellow pine.

11. The *gates* and *screens* are shown on the drawings. The materials and workmanship will be of the best quality; the parts to be truly fitted, and to work smoothly and well. The screens to be covered with wire cloth of copper, No. 15 wire, 25 meshes to the square inch.

12. The 48-inch water gate for the auxiliary pipe vault will be furnished by the United States, in Georgetown.

13. The iron pipes shown in the plans, weighing from one and a half to three and a quarter tons each, will be furnished by the United States on the Aqueduct wharf, in Washington, and be transported to the work and laid by the contractor.

14. The price per ton for transportation, the price for jointing, and the price for laying masonry and concrete, will cover the whole cost of placing them in the work.

15. For the manner of filling the joints of the pipes, reference is made to the specification for laying the mains of the Washington aqueduct, and they will be further secured by iron links, furnished by the United States.

PROPOSAL.

[N. B.—No bid will be considered unless all the blanks for prices are filled.]

16. We offer to furnish all the materials not furnished by the United States, to cut and rub the stones, to lay the masonry, transport the materials to the site, to furnish, set, and secure properly all the iron work, gates, valves, screens, beams, clamps, doors, and other things necessary to complete the structures referred to in the preceding specifications; to make the puddle and embankments, and to clear away all rubbish or waste, or coarse materials that may have accumulated about the site, for the following prices, to wit:

17. For furnishing Seneca gray sandstone for face work, per cubic foot	$0 26
18. For furnishing rubble stone for backing, per cubic yard	1 50
19. For rough cutting stone for foundations, substructure, &c., per superficial foot of surface cut	0 16
20. For fine cutting and rubbing, per superficial foot of exterior face of walls, cut fine and rubbed	0 65
21. For cutting and rubbing base-moulding, per lineal foot	0 75
22. For cutting and rubbing large entablature, consisting of architrave, frieze, and cornice, per lineal foot	1 00
23. For cutting and rubbing small entablature	1 00
24. For lantern on top of dome, complete	100 00
25. For vase or finial of small gate houses	30 00
26. For cutting and rubbing door mouldings, per lineal foot	1 00
27. For cutting stop plank groove, per foot rise	1 50
28. For slating, per square of 100 square feet	15 00
29. For large vault lights, cast iron and glass, per square foot	1 00
30. For small vault lights, cast iron and glass, per square foot	60
31. For concrete, including furnishing stone, per cubic yard	3 50
32. For laying stone masonry, per cubic yard	3 00
33. For laying bricks, per cubic yard	2 25
34. For cast iron doors and stairs, with hinges and locks, complete, according to the drawings to be furnished, per pound	11
35. For cast iron in gates, per pound, including workmanship	11
36. For wrought iron in gates, per pound, including workmanship	13
37. Wire cloth in screens, per square yard, in place	3 00
38. Transportation of cast iron pipes from Washington to the site of the work, per ton of 2,240 pounds	3 00
39. Jointing pipes, per joint of 48-inch pipe	10 00
40. Jointing pipes, per joint of 30-inch pipe	8 50
41. Jointing pipes, per joint of 12-inch pipe	3 00
42. For oak timber in stop plank and gates, per 1,000 feet board measure	50 00

43. For Carolina yellow pine in floors, &c., per 1,000 feet board measure..... $40 00
44. For embankment, per cubic yard..... 25
45. For puddling, per cubic yard, additional..... 15

46. The above prices include all materials not specified as furnished by the United States, all hauling, carts, machinery, tools, scaffolding, workmanship, and every expense necessary to complete the structures and their fixtures ready for use, except conduit and culvert centres, which will be furnished by the United States, but hauled, set up, and removed by the contractor.

47. Signed by us this 10th day of May, 1858.

SAMUEL FARWELL,
C. G. CASE,
T. D. ESTABROOK.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ———, and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the abovenamed guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

SPECIFICATION OF MASONRY.

General Description.

1. The various works of masonry are explained by drawings, and in the course of the work full working drawings of details will be furnished by the engineers.

2. The drawings will be strictly followed by the contractor.

3. The stone for dressed faced work, for ashlar, for ring stones of arches, and generally for cut and finished work, will be of gray sandstone from the government quarry at Seneca. This quarry is worked for the United States by H. L. Gallaher, and the stone is supplied at the following prices:

4. For quarrying ashlar, ring stones, steps, and other dimension stone, to be cut, per cubic foot..... $0 18
5. For rubble for backing, per perch..... 75

6. For cutting ring stones, steps, and coping, per superficial foot of surface cut..... 25
7. For cutting ashlar, rock face, per superficial foot of beds and joints..... 18
8. Stone delivered at the quarry on boats furnished by the contractor for masonry.

9. Stone will be delivered to the contractor, and charged to him at the above rates; or he may quarry sandstone of the same color and quality elsewhere, and cut them himself. It is also left optional with him whether to receive the stone in the rough at the first-named rate, and cut them himself, or to receive them ready cut at the rates specified.

10. Rubble stone for backing will be of hard blue stone or gneiss from the quarries near the line of the aqueduct and canal.

11. *Masonry*—to be built of sound, well-shaped, and durable stone, or hard, well-burned brick, laid in full beds of mortar, composed of clean, sharp sand and hydraulic cement.

12. The joints of mortar should not be more than three-eighths of an inch in thickness in brick work, and half an inch in stone. Iron clamps will be furnished by the United States, but the contractor will be required to build them into the masonry. The stones will be set carefully and accurately. The whole of the masonry will be laid in flush mortar and grouted, so as to insure every joint to be filled solid with cement mortar or grout.

13. Spandrels, abutments, and foundation walls will be of the best quality of rock face masonry, built with stones not less than six inches thick, nor less than eighteen inches bed; every stone less than two feet in thickness to have at least one-half more bed than rise; over that thickness it is sufficient that its bed and rise are the same. The bond shall in no case be less than eighteen inches; there shall be at least one header in every eight feet of a course, and no stone shall be considered as a header that is less than four feet in length. In spandrels and backing the stones in contact with the arch will be laid for the depth designated in the drawings, with their beds conforming to the radius lines of the arch.

14. Where masonry or concrete is laid upon or against rock, the rock must be first freed from all earthy matter by scraping and washing, and all irregularities and projections removed, so as to bring it to a uniform surface; it will also be kept wet at the time of laying the masonry, and all holes and depressions will be filled with concrete or with spalls, forced into full beds of mortar, and the stones forming the first course will be selected of the largest size. The stone used in masonry should be kept wet and free from any dirt that would prevent the adherence of the cement.

15. No foundation shall be built upon until it shall have been seen and approved of by the engineer in charge.

16. The coping of bridges will be built into the abutment and spandrel walls, having a wash on top and a drip channel underneath, two inches from the outer edge, as shown on the plan; the stone will be rough hammer-dressed, with joints of three-eighths inch, not less than three feet wide, and will be secured with iron dowels and

clamps, and copper gutters under the joints, as shall be directed by the engineer; the dowels and clamps and copper will be furnished by the United States. The price paid for coping will include any drilling or other preparation that may be necessary for their application.

17. The United States reserve the right to furnish the stone for the work, in whole or in part, to be delivered upon the berm bank of the Chesapeake and Ohio canal, adjacent to the work.

18. Concrete shall consist of broken stone, or brick, and cement mortar, in the proportions of one barrel of cement and two of sand to 30 cubic feet of broken stone or brick; the stone to be measured with care and well mixed with cement in the above proportions, on a platform of plank, convenient to the work, from which it may be shoveled or carried on a wheelbarrow to the place where it is to be used; and after being deposited and spread in layers one foot thick, it shall be rammed with wooden rammers until it is brought into a compact state.

19. The stone or brick for concrete shall be broken into fragments not exceeding half a pound in weight; but, whenever concrete is used in large masses, stones containing from 2 to 20 cubic feet may be deposited in it, care being taken that such stones rest on a good bed and are far enough apart to allow the rammers to pass between them, and insure the complete contact of the concrete with them.

20. When concrete is placed in contact with rock, the rock must be first scraped and washed.

21. The mortar used for masonry shall consist of one part of cement to two parts of clean sharp sand, to be first mixed dry, and afterwards water to be added as wanted, in small quantities; it shall be mixed upon an approved bed, formed of plank, under shelter from the sun and rain, and the time between the first wetting of the cement and its being used in the work shall never exceed one-half hour.

22. The cement will be furnished by the United States, and will be hauled by the contractor, at his own cost, from some one of the deposits of cement which shall be established by the United States on the bank of the canal, upon the written orders which he shall from time to time receive from the engineer for the same, and the engineer shall be the sole judge as to which deposit it shall be taken from, and shall express the same in said orders; the quantity drawn shall not in any case exceed 300 pounds to each yard of stone laid, nor 600 pounds to each 1,000 of brick laid. Any excess over this will be charged to said contractor, at the rate of 50 cents per 100 pounds. Any unnecessary waste of cement or sand, detected by the engineer, will also be charged against the contractor—the cement at the same rate of 50 cents per 100 pounds, and the sand at its value; and this whether the prescribed quantity be used in the work or not; and of the proper care to be exercised by the contractor the engineer shall be the sole judge.

23. The contractor will be required to keep the cement dry and secure from the weather until used, and return the bags in which it was furnished in good order.

24. Clean sharp sand will be contracted for with other parties by the United States, and will be delivered upon the berm bank of the Chesapeake and Ohio canal, at some convenient point near the work, and will be transported to the work by the contractor at his own cost. And the contractor will be required to pass it through a fine screen before using.

25. Bricks have been contracted for with other parties, and will be furnished delivered upon the banks of the canal, or at some other point equally convenient, and will be transported to the work by the contractor for masonry.

26. *Centering.*—Centres will be furnished by the United States, delivered upon the berm bank of the Chesapeake and Ohio canal, to be transported to the work by the contractor, at his own cost, and will be set by the United States.

27. It is expressly stipulated that although the United States agree to furnish the materials above named, yet that if, from any cause, there should be delay or failure on the part of the said United States, there shall not be any claim for damages on the part of said contractors against the United States.

28. The United States will contract with other parties to do the necessary excavation for the foundation; but the preparation of the rock to receive the masonry, as directed in the specifications, by removing projections, cleaning, &c., will be done by the contractor for the masonry, such work being included in the cost of laying the masonry.

29. The contractor shall clear away from the whole breadth of the aqueduct any coarse material that he may have brought upon it during the construction of his work.

30. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons, objected to by the engineer, retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of these rules; any violation of them will be considered sufficient ground for the engineer to declare the contract void.

31. The contractor will be required to give his personal and constant attention to the work during its progress.

32. The materials and workmanship shall be of the best quality, shall be subject to the inspection of the engineer in charge, or such person as he may appoint, and drawings will be furnished by him of all the details of the work, and such directions given as may be necessary to insure its construction in accordance with the plan contemplated in these specifications.

33. Any work not satisfactory to the engineer will be taken down by the contractor and rebuilt at his own expense.

34. The masonry of the side walls of bridges will be laid in proper shape to receive the brick lining of the conduit, and plastered on the inside with cement mortar. This plastering will then be covered with a coat of thick boiled coal tar and dry cement. The outer ring of brick will then be laid in cement mortar up to grade. This will be lined by the United States with asphaltic mastic, for greater

security against leakage. The inner lining or ring of brick will then be laid by the contractor up to grade, the centres placed, and the inner ring of the upper arch or curve of the conduit laid and plastered with hydraulic cement; a coat of asphaltic mastic will then be applied to the extrados of the brick arch; the remainder of the arch will be turned and covered with thick boiled coal tar and cement, and the masonry laid over it.

Know all men by these presents, that we, Samuel F. Case and Addison M. Farwell, of Fulton and Brooklyn, State of New York, are held and firmly bound unto the United States of America in the full and just sum of twenty thousand dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this 10th day of June, anno Domini one thousand eight hundred and fifty-eight. The condition of the above obligation is such, that if Farwell, Case, and Estabrook, their heirs, executors, or administrators, do and shall well and truly execute a contract which they, the said Farwell, Case and Estabrook have entered into with Captain Montgomery C. Meigs, of the United States corps of engineers, for and in behalf of the United States, by which they have contracted to excavate, construct, and build at their own proper cost, masonry at conduit head, gate-house at Great Falls, conduit between tunnels 1 and 2, and masonry structures about distributing reservoir of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said Farwell, Case and Estabrook by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect; otherwise to remain in full force and virtue in law.

SAMUEL F. CASE, [SEAL.]
A. M. FARWELL, [SEAL.]

Signed, sealed, and delivered in presence of—
H. C. POTTER, *Brooklyn.*

Six printed words erased and six written words substituted before signing.

NEW YORK, *June* 10, 1858.

I certify that I am acquainted with Samuel F. Case, of Fulton, and Addison M. Farwell, of Brooklyn, New York, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and, in my opinion, sufficient sureties for the purposes mentioned in the within bond.

J. S. T. STRANAHAN,
Brooklyn, New York.

WASHINGTON AQUEDUCT.

Contract for bridge No. 3, distributing reservoir, conduit under bank of distributing reservoir, and laying cast-iron mains.

Agreement between A. A. McGaffey, of the State of New York, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting under the authority of and for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

1. That the party of the first part, for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary, and which may not be furnished by the United States, and to do all the work in constructing and building bridge No. 3, distributing reservoir, conduit under bank of distributing reservoir, and laying cast-iron mains, or as much as may be necessary to complete the same, of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate, shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the Treasury of the United States for coin. No estimate after the first shall be paid unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after each separate work shall have been completed, and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by

said engineer in charge, together with the retained percentage upon that particular work.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that purpose, and the contractor shall, at all times, at his own expense, keep open a pathway along side of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work, of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract, that the work aforesaid shall be commenced within three days after the notification of the approval of this contract, that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within ———* months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed, that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then on a certificate of the fact, by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States; and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same, in any place, or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss, in case of default and for-

* The work to be completed within six months, except the distributing reservoir, which is to be completed within twenty-four months.

feiture of this contract, the said party of the second part shall be authorized to retain in his hands until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed by order of the engineer, from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer, which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14th, 1852, containing a proviso in the following terms, to wit:

"*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made:" *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular, the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this ninth day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

A. A. McGAFFEY, [L. S.]
M. C. MEIGS, [L. S.]
Capt. of Engs., Chief Eng. Wash. Aqueduct.

The specification as to time of completion written at foot of first page, before signatures.

Also, the word "*the*," in the body of the agreement, marked out, and the words "*each separate, upon that particular work*," interlined before signing.

[Done in quadruplicate.]
Witnesses:
As to A. A. McGaffey,
WM. G. MOORE.
J. W. DENHAM,
To signature of Capt. Meigs.

WASHINGTON AQUEDUCT.

Specification of the manner of completing Bridge No. 3, *across the valley at Station* 264.

GENERAL DESCRIPTION.

1. This bridge will be built of hard, gray, Seneca sandstone, of blue gneiss, and of hard, well-burned brick, all laid in cement mortar.

2. For the manner of constructing the masonry reference is made to the general specifications for masonry herewith, and to the work already done on this bridge.

3. The arch will be an oval, seventy-five feet span, and fifteen feet rise. The head rings of cut stone; the sheeting of gray, Seneca sand

stone rubble. The abutments and spandrels will be of rubble masonry, with a facing of rock-faced ashlar. The backing of the arch in the spandrels of thin stone laid radial to the arch.

4. The exterior facing of the whole work will be of hard, gray, Seneca sandstone.

5. The platform or roof of the bridge will be composed of slabs of Seneca gray sandstone, one foot in thickness, and two and a half to four feet in width, cut and laid according to the drawings, with close joints, and secured by dowels and clamps at the sides and ends.

6. Grooves will be cut in their upper surface, as shown in the plans, in order to carry off the rain water from the joints.

7. These stones will be well bedded in mortar and grouted; and afterwards the vertical joints will be cleaned out to a depth of three inches, and filled with asphaltic mastic.

8. The conduit through the bridge will be constructed of brick, as directed by the general specifications of masonry herewith.

9. The work has been commenced, the centre erected, machinery prepared and set up, and houses for the accommodation of the workmen built, and materials collected on the ground.

10. The contractor will be charged with the materials delivered, but not yet used in the work, at cost.

11. The machinery, houses, and other accessory works prepared for the construction of the bridge, will be at his disposal, he being held responsible for their return, on completion of the work, in good condition, ordinary wear and tear excepted. Any damage, injury, or loss which they may have suffered will be charged against the contractor on final settlement of his contract.

12. The centre will be taken down by the contractor, as directed by the engineer, and the timber properly piled up for removal.

PROPOSAL.

[N. B. No bid will be considered unless the blank for each price be filled.]

13. I offer to furnish all the materials not furnished by the United States, to cut the stone, to lay the masonry, and transport the materials to the site, and to do all the work necessary to complete the bridge described in the preceding specifications, and to clear away, after the work is finished, all rubbish, stone, and coarse material that may have accumulated about the site, in conformity to the specifications herewith, and to the directions I may from time to time receive from the engineer, for the following prices, to wit:

14. For cutting rock face ashlar, per superficial foot of cutting	$0 18
15. For cutting stone for ring stones, coping, and platform, per superficial foot of cutting	0 25
16. For furnishing Seneca gray sandstone for cut work, per cubic foot	0 20
17. For furnishing rubble stone for backing, per cubic yard	0 75
18. For laying stone masonry, including transportation of stone, cement, and sand from the bank of the canal, where delivered, to the work, per cubic yard	4 00

19. For laying bricks, including transportation, as in the preceding item, per thousand..... $3 00
20. For concrete, including furnishing stone and transportation, as in preceding item, per cubic yard..... 3 00
21. For furnishing wrought iron clamps, per pound..... 0 10

22. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, machinery, and tools not furnished by the United States, and every expense necessary to the completion of the whole work, according to the specifications and plans, and the contract which I may hereafter sign, in the form a copy of which has been shown to and read by me.

23. Signed by me this 10th day of May, 1858.

A. A. McGAFFEY.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of ——, in the State of ——, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of —— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said —— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said —— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification for the distributing reservoir at "The Drovers' Rest," near Georgetown.

1. The distributing reservoir, containing about fifty acres, will be made chiefly from excavation within its own limits; a small amount may be borrowed from conduit and pipe line cuts.

2. The banks, fourteen feet wide on top, will rise to a height of seven feet above the water line, and about seventeen feet above the highest part of the proposed bottom of the reservoir; but if found necessary to obtain material for embankment, the reservoir will be deepened. The outer slopes will be two to one, and the inner slopes one and a half to one for the upper twelve feet; below this level the inner slopes will be three to one.

3. There will be a ditch ten feet wide on the bottom, along the middle line of the reservoir, excavated to a depth of thirty-two feet below the level of the top banks, or fifteen feet below the general excavated bottom of the reservoir. Other small ditches will be made, if required, to drain the bottom when emptied.

4. A bank will be built across the reservoir, rising to about the

level of the water surface. The slopes of the ditch and cross bank will be two to one.

5. The inner slopes of the reservoir bank and both slopes of the cross bank will be covered with a rip rap of rough stone one and a half foot thick for such height as may be required, the stones not to exceed in size cubes of three inches.

6. There will be three gate-houses near or within the reservoir, the excavation of the pits for which, and for any other mechanical works about the reservoir, the contractor of the reservoir will make, if required, at such time and in such manner as the engineer may direct, the material removed being carried into his embankment, if required, and paid for as embankment only.

7. A puddle ditch will be cut wherever a bank is to be placed, and in ravines or ground with steep slopes benching will be required. The shape and dimensions of the ditching and benching will be determined by the engineer.

8. A puddle wall will be made throughout the whole length of the bank surrounding the reservoir, wherever the natural surface of the ground is below the level of the intended water surface of the reservoir. It will rise to a level six feet above the water surface of the reservoir, at which point it will be six feet wide, and it will have a batter on each side of four inches base to one foot rise.

9. A trench for a conduit of seven feet interior diameter will be excavated along the north side of the reservoir, the excavation from which, if required, will be carried into the embankment of the reservoir. In such case, the excavation will be estimated and paid for as embankment only. After the conduit is built, the trench will be refilled as high as may be needed, and the refilling will be paid for as embankment.

10. On the north side of the reservoir there will be a ditch to carry off the surface drainage from the hills, and prevent its flowing into the reservoir. This may be in whole or in part over the 7-feet conduit. The excavation from this drain will be used in the embankment, and will be estimated and paid for as embankment only.

11. A culvert will be placed under the cross bank and in the line of the long ditch, for the passage of water from one section of the reservoir into the other, and will have fixtures for holding up the water in one division when the water may be drawn off from the other. The United States reserves the right to build this work, if deemed advisable, or to let it to another contractor, but may require the contractor for the reservoir to make the necessary excavation, and to do the necessary puddling, &c.

12. If section No. 15 of the pipe line east of the reservoir be worked by any other than the contractor for the reservoir, any surplus excavation from either or both of these works may be used in the reservoir banks, if required by the engineer, and the amount of embankment so made will not be allowed to the contractor for the reservoir; and if such excavation be made by the contractor for the reservoir, they will be measured and paid to him as embankment only.

13. *Clearing and grubbing* —Before commencing any excavation or embankment, the whole space to be occupied by the reservoir and its

banks will be cleared of all trees, timber, logs, stumps, rails, posts, and brushwood, and the ground for the base of the bank as well as that part of the reservoir from which no embankment will be taken, will be well and thoroughly grubbed.

14. *Mucking.*—The surface of the ground after being cleared and grubbed as above described, will be excavated to such depth as may be found necessary to remove all grass, soil, and mould, and so much of the mucking as may be required will be reserved for an outer covering for the banks.

15. *Puddle ditches and benching.*—The puddle ditches will vary in width with the level of the ground, and in depth with the character of the soil. They will be wide enough to receive the puddle wall, before described. The benches will be steps made upon sloping surfaces to support embankments, and will be regulated in all respects by directions to be given from time to time by the engineer.

16. All excavations for puddle ditches, for benches, and so much of the mucking as may require to be twice handled, will be estimated and paid for as *excavation;* but all other earth removed from the reservoir and its works will be estimated in the bank, and be paid for as embankment only, excepting that rock which it may be necessary to remove and which may be unfit or not required for the inner rip-rap facing of the banks, will be paid for at the prices of rock excavation.

17. Hard stone or rock that may be found in the reservoir may be used by the contractor in the protection of the banks, after breaking it to the required size, and will be paid for only as rip rap.

18. Detached stone less than three cubic feet in size will be included in the third class of excavation, (Item No. 4 of the following proposal;) all others not exceeding twenty cubic feet, will be included with soft rock, (item No. 3.)

It is understood that soft or rotten rock is such as cannot be excavated by the shovel, spade, plough, or pick alone, but requires the use of the crowbar and pick to break it up, yet is not hard enough to require drilling and blasting.

Hard rock is such as requires drilling and blasting in order to be broken up.

Materials not included in the above two items will be estimated as earth or mucking.

Of this classification the engineers will be the judges; the decision of the engineer in charge will be final in case of difference between the local engineer and the contractor.

19. Should a surplus of hard rock be found in the reservoir, and it be excavated by order of the engineer, it will be used in protecting the bottom of the reservoir near the banks, or on the outer side of the banks, or piled up for removal to such place as may be designated.

This surplus, if any, will be paid for as rock excavation.

20. Mucking thrown up in piles and *paid for as excavation,* when carted into outer covering of banks, will be estimated and paid for as embankment, *in addition to* the excavation prices.

21. *Embankment* will be carted in, and spread in layers of three

inches in depth; and such parts as may require it will be well rammed and puddled.

22. When earth is required to be rammed, it will be done (in courses not exceeding three inches in thickness) with a heavy maul of iron or wood, and it will be packed evenly and uniformly to prevent uneven settlement. Where puddling is required, the earth will be spread in layers not exceeding six inches in depth, and each course will be well sprinkled with water and tramped, and then be cut through with a spade or shovel into the ground or course below, water being added as the cutting goes on until it is worked into a stiff and cohesive mass, before another course is commenced. The quantity, quality, and disposition of rammed and puddled earth will be regulated by the engineers. It will be measured, estimated, and paid for as embankment, to which the price affixed in the following proposal for ramming or puddling, as the case may be, will be additional.

23. No logs, trees, stumps, brushwood, roots, leaves, grass, or stones shall be left in or admitted into any part of the embankment; and no frozen earth or clods will be admitted, except by special permission of the engineer, and then only in the outer edge of the embankment.

24. The banks when finished will be made smooth on the top and slopes, and when complete the soil and muck which may be reserved for this purpose will be thrown upon the top and outer slopes, and be trimmed to conform to them.

25. All work done under these specifications will be in all respects in strict conformity with the directions of the engineers, and any work which they may require and which may not be specified, will be executed by the contractor, and will be valued by the engineer in charge, whose valuation will be final and without appeal.

26. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons objected to by the engineer shall be retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of this rule; any violation of it will be considered sufficient ground for the engineer to declare the contract void.

27. *Extra work.*—No allowance for extra work, beyond that specified, will be made, except such as shall have been done by the special written order of the engineer. All claims for extra work must be presented to the engineer at the end of the month in which such extra work shall be done, to be settled in the estimate of work done within that month, or they will not be considered.

28. *Monthly estimates.*—Monthly estimates will be made between the first and tenth of each month approximate of the whole amount of work done within the month, and as soon thereafter as practicable a payment will be made of nine-tenths of such estimates. But should the contractor abandon the work or the engineer declare the contract void, all the work not paid for, as well as the retained percentage, will be forfeited to the United States.

29. No contract will be sublet in whole or in part, but the contractors will be required to give their personal and constant attention to the work during its progress.

30. The subscriber offers to contract to do all the earth work and rip rap about the distributing reservoir at the prices mentioned in the following table, and to complete the work according to the preceding specifications, and upon the terms and conditions stipulated in the contract which he may hereafter subscribe, in the form of which a copy has been shown to and read by him:

GRUBBING.	EXCAVATION.				EMBANKMENT.			RIP RAP PROTECT'N
1	2	3	4	5	6	7	8	9
Reservoir.	Cubic yards	Cubic yards.	Cubic yards.	Cubic yards.	Cubic yards.	Cubic yards.	Cubic yards.	Cubic yards.
Grubbing and clearing the trees, brush, stumps, roots, &c., from the space required for the reservoir, and the banks and excavations.	Of soft rock which may be unfit for facing banks, and which must be removed from the reservoir.	Of hard rock requiring blasting, not needed for rip rap.	Of mucking which may be required to be piled for future use in covering of the banks, of puddle ditches, and of benching.	Of earth or loose stone.	Embankment of earth.	Puddling of earth paid for as embankment, *in addition to such embankment price.*	Ramming of earth paid for as embankment, *in addition to such embankment price.*	Rip rap protection and covering of the banks of hard stone to be provided by the contractor either from within or without the reservoir.
$5,000 00	$0 75	$1 25	$0 20	$0 15	$0 15	$0 12	$0 12	$1 50

Signed by me, this tenth day of May, in the year of our Lord 1858.

A. A. McGAFFEY.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of , in the State of , hereby jointly and severally, covenant with the United States, and guaranty in case the foregoing bid of be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said should fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specifications for conduit under bank of distributing reservoir.

1. The conduit will be circular, and generally of seven feet interior diameter; it will, when of brick, be built of two separate four and a half inch rings of hard brick.

2. Where directed by the engineer concrete or rubble stone masonry will be substituted for brick, in whole or in part, particularly in the lower or reversed arch.

3. Proposals will be received for each kind of work, and where stone is used, for furnishing it both in shape and size for masonry and for concrete.

4. The centre of the conduit at any point is the *grade* of the aqueduct at that place. The excavations and embankments will be made to the level of grade at each place of operations before the contractor for the conduit will be allowed to commence his work there. The excavation for the lower semicircle or reversed arch, however, will generally be made by the contractor for the conduit, and it will be trimmed out but little in advance of the laying of the masonry. After a length of one hundred feet of masonry is finished the excavation for the next one hundred feet, if of suitable material, will be placed upon the work just laid as back filling, and will be well rammed to sustain the haunches of the arch.

5. This excavation, when in earth, will be carefully made to the prescribed form of the extrados of the reversed arch; it will be evenly trimmed to receive the masonry or concrete, without waste of mortar.

6. Where embankments are made in ravines, the excavation of adjacent cuts will be made by the contractors for graduation, who may be required in such places to excavate in part the lower semicircle. The excavation thus made will be about three and a half feet deep, six feet wide on top, and four feet wide on bottom, and will leave the remainder of the excavation to be removed in trimming; such trimming will be paid for by the lineal foot. The material taken out will be used in embankment, and will be paid for as such, unless it be rock, when it will be paid for as excavation. The price for trimming is intended to cover the expense of preparing the trench for the conduit.

7. In places where the excavation above grade shall be left untouched or unfinished by the contractor for graduation, the contractor for conduit may be required to take it for the back filling for any finished conduit, and will be paid for it only as embankment; and any solid rock requiring blasting or quarrying in such cuts will be paid for as rock excavation. If needed for masonry or concrete, the contractor may use it, if suitable, without charge therefor, and he will be paid for his masonry or concrete as though he had furnished the stone from without the work.

8. In rock cuttings care will be taken to cut the lower semicircle as nearly as possible to the required form, and any irregularity made in blasting and quarrying will be filled with the masonry or concrete,

which in such places may be required to take the place, in whole or in part, of the brick work below grade.

9. *Brick masonry in conduit.*—The bricks, at the time of laying, will be thoroughly wet; every brick must be laid and pressed down into a full bed of mortar, which shall cover its bed and joints; and this bedding shall be done at one operation for each brick, so that no mortar need be worked in after the brick is placed. The inner edge of the joint of each course will be the least possible to admit of mortar between the bricks. The joint of mortar between each two rings will not be less than three-eighths of an inch in thickness.

10. The masonry or concrete will not be commenced at any point until the trench, trimmed and prepared, has been inspected and approved by the engineers.

11. *Stone masonry of conduit.*—This will be made of small rubble stone, none of which will exceed fourteen inches in width or depth. Each stone will be laid in a full bed of mortar, and hammered till the mortar is pressed out at the front, and the joints are completely filled. The work, when laid together, shall be water tight, and if upon trial it should prove not to be so, it will be taken up and relaid by the contractor at his own expense. Its inner surface will be well plastered with a coat of cement mortar, and be floated smooth and even.

12. *Concrete.*—The stone for concrete must be hard and sound. It will be broken to pass through a two-inch ring. It must be kept free from sticks and dirt, and when mixed and laid will be rammed into a compact and water-tight mass.

13. One barrel of cement, with two barrels of sand and thirty cubic feet of stone, will make a batch of concrete.

14. The materials must all be measured—the sand and cement in barrels, and the broken stone in boxes containing ten cubic feet each; which boxes will be furnished by the United States.

15. The mortar having been spread upon a bed of plank, the broken stone will be spread evenly over it, and the whole mass turned over twice, and thoroughly mixed with a hoe or shovel.

16. It will then be deposited in its place, and carefully packed to form, either by ramming or by floating the upper or exposed surface with a straight-edge.

17. The concrete and masonry of the reversed arch will average the required thickness in each place, and be estimated and paid for as of that thickness, and no allowance will be made to the contractor for filling up any excess of size in the excavation of the trench.

18. Full directions with drawings of the mode of construction, whether of brick alone or of brick, stone, or concrete, in whole or in part, in each portion of the work, will be given by the engineer from time to time, and he will be the judge as to which mode of construction is to be adopted in each portion of the work.

19. Before the centres are struck, the ground between the arch and the bank in cuts and the top of embankments over low grounds will be well cleared of all rubbish, and such space as may be required will be filled with fine water-tight earth, and be well rammed or puddled to support the haunches of the arch.

20. *Embankment and backfilling.*—After clearing off the space

between the conduit and the sides of cuts and the top of the embankments, the banks above grade will be carried up. These will, so far as practicable, be carted in and spread in layers of three inches in depth.

21. When earth is required to be rammed, it will be done (in courses not exceeding three inches in depth) with a heavy maul of iron or wood, and will be packed evenly and uniformly to prevent uneven settlement. Where puddling is required, the earth will be spread in layers not exceeding six inches in depth, and each course shall be well sprinkled with water and tramped, and then be cut through with a spade or shovel into the ground or course below, water being added as the cutting goes on, until it is worked into a stiff and cohesive mass before another course is commenced. The quantity, quality, and disposition of rammed and puddled earth will be regulated by the engineer. It will be measured, estimated, and paid for as embankment carried into bank, to which the price affixed in the following proposal for ramming or puddling, as the case may be, will be additional.

22. No logs, trees, stumps, brushwood, roots, leaves, grass, or stones, shall be left in or admitted into any part of the embankment; and no frozen earth or clods will be admitted, except by special permission of the engineer, and then only in the outer edge of the embankment.

23. The banks when finished will be made smooth on the top and slopes; and when complete the soil and muck which may be reserved for this purpose will be thrown upon the top and slopes, and be trimmed to conform to them.

24. All work done under these specifications will be in all respects in strict conformity with the directions of the engineers, and any work which they may require and which may not be specified, will be valued by the engineer in charge; and his decision shall be final and without appeal.

25. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons objected to by the engineer shall be retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of this rule; any violation of it will be considered sufficient ground for the engineer to declare the contract void.

26. *Mortar.*—The mortar for masonry will be made of two parts by measure of clean, sharp, well-screened sand, to one part of cement. It will be mixed on a bed of plank, to be approved by the engineer. The mortar bed will be protected by a canvas shelter from soaking rains or drying sun.

27. The sand and cement, after being measured, will be mixed dry, and small quantities only taken from the heap, will be mixed with water as required.

28. The time from the first wetting of the cement to the using of the mortar shall not exceed half an hour.

29. Cement will be furnished by the United States at their cement house on the bank of the canal, from which it will be transported by the contractor at his own cost. It will be drawn upon the written orders of the engineer, who will be the sole judge as to which depot

it shall be drawn from, and shall express the same in said orders. The quantity shall not in any case exceed six hundred pounds to each thousand brick, nor three hundred pounds to each cubic yard of stone laid. Either in masonry or concrete any excess over this will be charged to the contractor, at the rate of fifty cents per hundred pounds. Any unnecessary waste of cement detected by the engineer will also be charged against the contractor at the same rate, whether the prescribed quantity be used in the work or not; and of the proper care exercised by the contractor the engineer will be the judge. The contractor will be required to provide sheds for keeping the cement at the work dry and secure from the weather, and he will also return the bags or barrels, if required, to the United States.

30. Sand will be furnished by the United States on the bank of the canal. It will be hauled by the contractor at his own cost, and deposited upon beds to be by him prepared for it, to be approved by the engineer. It must be transported, deposited, and used without waste, and any waste will be charged to the contractor.

31. He will be required to haul sand in advance of his work, if necessary to clear the bins and landings for the reception of additional sand.

32. Bricks will be furnished by the United States, delivered upon the banks of the canal, or at some other point equally convenient, and will be transported to the work by the contractor for masonry. The landings from which they are to be taken will be designated by the engineer.

33. It is expressly stipulated that, although the United States agrees to furnish the materials above named, and will make every effort to do the same, yet that if from any cause there should be delay or failure on the part of the said United States, there shall not be any claim for damages on the part of said contractors against the United States.

34. The forms and the centres for laying the conduit will be furnished by the United States at the rate of three hundred feet of centres for each gang of not less than twelve bricklayers, but the contractor for the conduit will be required to transport them from the bank of the canal to his work, and from any one part of it where they may have been deposited or used to any other part where they may be needed; he will set them under the direction of the engineer, and he will be required to take proper care that they be not unnecessarily damaged. If damaged, they will be repaired by the United States at the expense of the contractor. He will also give due notice to the engineer of the time when he will need centres, cement, and sand, and of the quantity of each.

35. All work done under this specification will be in all respects in strict conformity with the directions of the engineer, and any work which he may require to be done, and which may not be particularly specified, will be valued by the engineer, and his decision will be final and without appeal.

36. The subscriber offers to contract to do all the work required to prepare for, lay, and embank over the conduit on section No. —, at the prices stated in the following table, and to complete the work according to the preceding specifications, and upon the terms and con-

ditions stipulated in the contract which he may hereafter subscribe, in the form a copy of which has been shown to and read by him.

TRIMMING FOR CONDUIT.	EXCAVATION OF SOLID ROCK.		LAYING CONDUIT.			EMBANKMENT AND BACK FILLING.		
Below grade.	Below grade.	Above grade.	Brick.	Stone.	Concrete.	Embankm'nt proper.	Ramming.	Puddling.
Per lineal foot.	Per cubic yd.	Per cubic yd.	Per M.	Per cubic yd.	Per cubic yd.	Per cubic yd.	Per cub. yard.	Per cub. yard.
Trimming the trench below grade, and preparing it for conduit.	Excavation of solid rock found in the trench below grade.	Excavation of solid rock above grade in the cuts which may be left by the graduation contractor, and which the contractor for conduit will be required to complete.	Laying bricks in the conduit, including the transportation of cement, sand, and brick from the canal or depots to the work.	Laying stone in conduit when required, including furnishing the stone and its transportation to the work, and the transportation of cement and sand from the canal or depots to the work, and plastering the inner face.	Concrete where required, including the furnishing, transportation, and breaking of stone, and the mixing and putting in of the concrete to the required form, and transportation of cement and sand from the canal or depots to the work.	Embankment placed around and over the conduit, whether taken from the cuts or borrowed.	Ramming earth—in addition to the price paid for it as embankment.	Puddling earth—in addition to the price paid for it as embankment.
$0 20	$1 25	$1 25	$4	$3	$3	$0 15	$0 10	$0 10

Signed by me this 10th day of May, in the year of our Lord 1858.

A. A. McGAFFEY.

To Captain M. C. Meigs, United States Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby, jointly and severally covenant with the United States, and guaranty in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the abovenamed guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specifications for laying the cast-iron mains of the Washington Aqueduct.

1. *Distribution of the pipes.*—The mains are cast in lengths of nine or twelve feet, their interior diameter varying from twelve inches to

forty-eight inches, and their weights from six hundred and fifty pounds to about three tons. There are also reducing pipes, bends, branches, &c. of various dimensions and weights.

2. These are to be hauled from or to such points on the line between the distributing reservoir and Georgetown, and to such point or places of the cities of Washington and Georgetown, as the engineer in charge may select; and they are to be distributed in such quantitities, at such points, and in such time and manner as he may require.

3. The pipes are to be taken, after inspection and approval, from such points as the said engineer may select to deliver them, and placed along the lines designated in a neat and regular manner, and in such proximity to the proposed trench for their reception as the said engineer or his deputy may deem proper.

4. The greatest care is to be observed in loading and unloading and delivering the pipes, so as to avoid the possibility of their injury by shocks and blows. Any damage will be charged against the contractor.

5. The price paid for hauling shall be for the ton of 2,240 (twenty-two hundred and forty) pounds, and shall cover all charges incident to the transportation, loading, unloading, and distribution of the pipes.

6. *Excavation of the trench.*—The location, width, depth, and form of the trench, which is to receive the pipes aforesaid, will be determined in all cases by the aforesaid engineer or his assistant, and defined upon the ground by appropriate stakes and demarcations, and the dimensions so given, as well as the instructions with regard to the work given by the said engineer or his assistant, are to be carefully and accurately conformed to by the contractor.

7. In paved streets, before excavating the trench, the pavement is to be removed for a width, six inches on each side, greater than the width of said trench, and the stones so obtained are to be carefully piled alongside.

8. The trench is to be opened no faster than the pipes can be laid into it and filled over, and in no case shall a greater length of trench than the engineer or his assistant may deem safe and proper be opened at one and the same time. The top width of the said trench shall in no case be less than 2½ (two and a half) feet.

9. *Refilling the trench.*—The trench is not to be refilled with the material obtained from its excavation until the joints shall have been completed to the satisfaction of the engineer or his deputy.

10. The trench is to be refilled by layers of earth not more than 6 (six) inches in thickness, distributed as evenly as possible along the trench. The earth is to be thoroughly rammed around and under the pipe without disturbing it from its position, with pointed iron bars, so as to secure for it, at all points, a perfectly firm and equal bearing. The filling and ramming in these layers is to be continued until the trench is completely filled; the surplus earth, if any, is then to be deposited in a mound over the trench, and so left until, in the opinion of the said engineer or his assistant, the pavement may be replaced without risk of settlement.

11. The repaving of the street shall then be executed by the con-

tractor in a neat and workmanlike manner, to the satisfaction of the engineer aforesaid, or his deputy.

12. The contractor shall provide at his own expense, the proper barricades and signals, by night and day, for the protection of vehicles or passengers along the streets, and he shall be responsible for any damage resulting from carelessness in this particular. He shall also be careful to interfere with or interrupt to as small an extent as possible, under the circumstances, the travel along the streets of the cities aforesaid.

13. The greatest care shall be taken to avoid injury to gas or water pipes which the excavation of the trench may expose, and the contractor shall be held accountable to the United States for the cost of tepairing or satisfying any damages resulting therefrom.

14. No sewer, culvert, or drain shall be interfered with in any manner, except as the engineer or his assistant may determine or sanction.

15. At the crossing of the canal on Four-and-a-half street west, the pipes will be sunk below the water into a trench dredged out to such a depth as shall insure their safety, and the price of excavation of the said trench shall be the same per cubic yard as for that over seven feet in depth on dry land. No charge is to be made for joining or sinking the pipe beyond that paid on the remainder of the line.

16. The unit of measure for the excavation of the aforesaid trench shall be the cubic yard; the prices paid for the same shall cover all costs incident to the excavation and refilling, as hereinbefore specified; also the shoring of the sides of the trench, where the said engineer or his deputy shall deem such a precaution necessary, and the depositing of the pipes in the trench, ready for the operation of caulking the joints.

17. The measurement of the excavation of the trench shall be according to the dimensions as given by the engineer aforesaid, or his assistant, before opening the trench, unless he shall deem it proper to alter those dimensions.

18. No allowance will be made or expected for excavation outside of these, and, in case of falls or slides from the sides of the excavation, the contractor aforesaid will remove at his own expense and restore the trench, as to its grade, to the same condition as before the said falls or slides had taken place. He shall also keep the trench clear of water at his own cost.

19. The work of repaving the trench will be estimated and paid for by the square yard, and the price paid for this work shall cover all charges incident to the same, from the removal of the stones to the complete restoration of the street surface, including crossings, &c.

20. *Laying the pipes.*—The pipes will in no case be allowed to rest for their final foundation upon stone or upon the bottom of the trench as excavated, but shall be temporarily supported, about 6 (six) inches above the bottom, by mounds of earth near the ends of the pipes until the caulking and filling of the joints is completed; after which the earth is to be filled in as hereinbefore specified.

21. The pipes shall be laid so as to allow one-quarter of an inch play for expansion and contraction lengthways. The line of the pipes is to conform accurately to that established by the said engi-

neer or assistant. It is understood that no excavation is to be paid for until the trench is refilled, as hereinbefore specified.

22. *Jointing the pipes.*—The annular space between the pipes at the joints shall be fitted, well-filled, and thoroughly caulked with the proper tools, with sound and well-tarred gasket of the best quality. This gasket must be introduced in rolls, the ends breaking joints on the opposite sides of the pipes so as surely to prevent the lead from running through. Great care must be taken to secure the thorough packing of this gasket, and at the same time to avoid injury to the bell of the pipe by careless blows of the caulking hammers. The rolls of gasket are to be of such uniform diameter as to insure the exact fitting and concentricity of the interior surfaces of the two ends of pipe joined.

23. The weight of the caulking hammer is not to exceed three pounds for the small pipes or seven for the large ones.

24. The joint is to be filled with gasket until within a certain distance of the mouth of the bell of the pipe, which distance shall be as follows:

For pipe twelve inches in diameter and under, 2 inches.

For pipe over twelve inches and not over thirty inches in diameter, 2½ inches.

For pipe over thirty inches and not over fifty inches in diameter, 3 inches.

25. The remainder of the joint is to be filled with lead poured in carefully, so as to fill it completely, and, after cooling, well hammered and caulked into it, so as to be perfectly water-tight. No extra charge will be allowed for laying on curves.

26. The lead and all other materials will be furnished by the contractor.

27. The price paid for this work will be at a certain rate per joint, and this price is understood to cover the joints of branches, bends, and cocks or valves, and all the materials, tools, &c.

28. The contractor for this work will be held responsible for the cost of repairing all leaks which may occur for six months after the introduction of the water into the cities; and with this view there will be a reservation of ten per cent. upon all payments under this specification retained by the United States until that time shall have elapsed, when so much of said reservation as shall remain due to the contractor, after deducting the cost of said repairs, shall be paid to him.

PROPOSAL.

29. I offer to do the work according to these specifications signed by me at the following prices, to wit:

30. For hauling for all distances, per ton of 2,240 pounds...	$1 50
31. Excavation under and up to seven feet in depth, per cubic yard	15
32. Excavation under twelve and over seven feet in depth, per cubic yard	18
33. Hard rock excavation, per cubic yard	1 25
34. For paving, per square yard	15
35. For laying four-inch pipes and under, per joint	1 50

36. For laying six-inch pipes, per joint..... $1 75
37. For laying eight-inch pipes, per joint 2 00
38. For laying ten-inch pipes, per joint..... 2 50
39. For laying twelve-inch pipes, per joint..... 2 50
40. For laying twenty-inch pipes, per joint..... 3 50
41. For laying thirty-inch pipes, per joint..... 6 00

42. All work not specified to be paid for at the estimate of the engineer in charge, whose decision shall be final and conclusive in all matters connected with or questions arising out of this contract.

43. The above prices include all materials, tools, hauling, lumber, workmanship, and every expense attending the hauling and laying of the pipes with the valves and other attachments, ready for the introduction of the water.

44. Signed by me, this tenth day of May, 1858.

A. A. McGAFFEY.

To Captain M. C. Meigs, United States Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby, jointly and severally covenant with the United States, and guaranty in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was mode. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the abovenamed guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification of masonry—General description.

1. The various works of masonry are explained by drawings, and in the course of the work full working drawings of details will be furnished by the engineers.

2. The drawings will be strictly followed by the contractor.

3. The stone for dressed face work, for ashlar, for ring stones of arches, and generally for cut and finished work, will be of gray sandstone from the government quarry at Seneca. This quarry is worked for the United States by H. L. Gallaher, and the stone is supplied at the following prices:

4. For quarrying ashlar, ring stones, steps, and other dimension stone, to be cut, per cubic foot..... $0 18
5. For rubble for backing, per perch..... 75
6. For cutting ring stones, steps, and coping, per superficial foot of surface cut..... 25
7. For cutting ashlar, rock face, per superficial foot of beds and joints..... 18

8. Stone delivered at the quarry on boats furnished by the contractor for masonry.

9. Stone will be delivered to the contractor, and charged to him at the above rates; or he may quarry sandstone of the same color and quality elsewhere, and cut them himself. It is also left optional with him whether to receive the stone in the rough at the first-named rate, and cut them himself, or to receive them ready cut at the rates specified.

10. Rubble stone for backing will be of hard blue stone or gneiss from the quarries near the line of the aqueduct and canal.

11. *Masonry*—to be built of sound, well-shaped, and durable stone, or hard, well-burned brick, laid in full beds of mortar, composed of clean, sharp sand and hydraulic cement.

12. The joints of mortar should not be more than three-eighths of an inch in thickness in brick work, and half an inch in stone. Iron clamps will be furnished by the United States, but the contractor will be required to build them into the masonry. The stones will be set carefully and accurately. The whole of the masonry will be laid in flush mortar and grouted, so as to insure every joint to be filled solid with cement mortar or grout.

13. Spandrels, abutments, and foundation walls will be of the best quality of rock face masonry, built with stones not less than six inches thick, nor less than eighteen inches bed; every stone less than two feet in thickness to have at least one-half more bed than rise; over that thickness it is sufficient that its bed and rise are the same. The bond shall in no case be less than eighteen inches: there shall be at least one header in every eight feet of a course, and no stone shall be considered as a header that is less than four feet in length. In spandrels and backing, the stones in contact with the arch will be laid for the depth designated in the drawings, with their beds conforming to the radius lines of the arch.

14. Where masonry or concrete is laid upon or against rock, the rock must be first freed from all earthy matter, by scraping and washing, and all irregularities and projections removed, so as to bring it to a uniform surface; it will also be kept wet at the time of laying the masonry, and all holes and depressions will be filled with concrete or with spalls, forced into full beds of mortar; and the stones forming the first course will be selected of the largest size. The stone used in masonry should be kept wet, and free from any dirt that would prevent the adherence of the cement.

15. No foundation shall be built upon until it shall have been seen and approved of by the engineer in charge.

16. The coping of bridges will be built into the abutment and spandrel walls, having a wash on top, and a drip channel underneath, two inches from the outer edge, as shown on the plan; the stone will be rough hammer-dressed, with joints of three-eighths of an inch, not less than three feet wide, and will be secured with iron dowels and clamps, and copper gutters under the joints, as shall be directed by the engineer; the dowels and clamps and copper will be furnished by the United States. The price paid for coping will include any drilling or other preparation that may be necessary for their application.

17. The United States reserve the right to furnish the stone for the

work, in whole or in part, to be delivered upon the berm bank of the Chesapeake and Ohio canal, adjacent to the work.

18. Concrete shall consist of broken stone, or brick, and cement mortar, in the proportions of one barrel of cement and two of sand to thirty cubic feet of broken stone or brick; the stone to be measured with care and well mixed with cement in the above proportions, on a platform of plank convenient to the work, from which it may be shovelled or carried on a wheelbarrow to the place where it is to be used; and after being deposited and spread in layers one foot thick, it shall be rammed with wooden rammers until it is brought into a compact state.

19. The stone or brick for concrete shall be broken into fragments not exceeding half a pound in weight; but, whenever concrete is used in large masses, stones containing from two to twenty cubic feet may be deposited in it, care being taken that such stones rest on a good bed, and are far enough apart to allow the rammers to pass between them and insure the complete contact of the concrete with them.

20. When concrete is placed in contact with rock, the rock must be first scraped and washed.

21. The mortar used for masonry shall consist of one part of cement to two parts of clean sharp sand, to be first mixed dry, and afterwards water to be added as wanted, in small quantities; it shall be mixed upon an approved bed, formed of plank, under shelter from the sun and rain, and the time between the first wetting of the cement and its being used in the work shall never exceed one half-hour.

22. The cement will be furnished by the United States, and will be hauled by the contractor, at his own cost, from some one of the deposits of cement which shall be established by the United States on the bank of the canal, upon the written orders which he shall from time to time, receive from the engineer for the same, and the engineer shall be the sole judge as to which deposit it shall be taken from, and shall express the same in said orders; the quantity drawn shall not in any case exceed 300 pounds to each yard of stone laid, nor 600 pounds to each 1,000 of brick laid. Any excess over this will be charged to said contractor at the rate of 50 cents per 100 pounds. Any unnecessary waste of cement or sand detected by the engineer, will also be charged against the contractor—the cement at the same rate of 50 cents per 100 pounds, and the sand at its value; and this whether the prescribed quantity be used in the work or not; and of the proper care to be exercised by the contractor, the engineer shall be the sole judge.

23. The contractor will be required to keep the cement dry and secure from the weather until used, and return the bags in which it was furnished in good order.

24. Clean sharp sand will be contracted for with other parties by the United States, and will be delivered upon the berm bank of the Chesapeake and Ohio canal, at some convenient point near the work, and will be transported to the work by the contractor, at his own cost. And the contractor will be required to pass it through a fine screen before using.

25. Bricks have been contracted for with other parties, and will be furnished delivered upon the banks of the canal, or at some other

point equally convenient, and will be transported to the work by the contractor for masonry.

26. *Centering.*—Centres will be furnished by the United States, delivered upon the berm bank of the Chesapeake and Ohio canal, to be transported to the work by the contractor, at his own cost, and will be set by the United States.

27. It is expressly stipulated that although the United States agree to furnish the materials above named, yet that if, from any cause, there should be delay or failure on the part of the United States, there shall not be any claim for damages on the part of said contractors against the United States.

28. The United States will contract with other parties to do the necessary excavation for the foundation; but the preparation of the rock to receive the masonry, as directed in the specifications, by removing projections, cleaning, &c., will be done by the contractor for the masonry, such work being included in the cost of laying the masonry.

29. The contractor shall clear away from the whole breadth of the aqueduct any coarse material that he may have brought upon it during the construction of his work.

30. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons, objected to by the engineer, retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of these rules; any violation of them will be considered sufficient ground for the engineer to declare the contract void.

31. The contractor will be required to give his personal and constant attention to the work during its progress.

32. The materials and workmanship shall be of the best quality, shall be subject to the inspection of the engineer in charge, or such person as he may appoint, and drawings will be furnished by him of all the details of the work, and such directions given as may be necessary to insure its construction in accordance with the plan contemplated in these specifications.

33. Any work not satisfactory to the engineer will be taken down by the contractor and rebuilt at his own expense.

34. The masonry of the side walls of bridges will be laid in proper shape to receive the brick lining of the conduit, and plastered on the inside with cement mortar. This plastering will then be covered with a coat of thick boiled coal tar and dry cement. The outer ring of brick will then be laid in cement mortar up to grade. This will be lined by the United States with asphaltic mastic, for greater security against leakage. The inner lining, or ring of brick, will then be laid by the contractor up to grade, the centres placed, and the inner ring of the upper arch or curve of the conduit laid and plastered with hydraulic cement; a coat of asphaltic mastic will then be applied to the extrados of the brick arch; the remainder of the arch will be turned and covered with thick boiled coal tar and cement, and the masonry laid over it.

Know all men by these presents that we, M. T. Seymour and D.

C. McCollum, of the State of New York, are held and firmly bound unto the United States of America in the full and just sum of sixty thousand dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this ninth day of June, anno Domini one thousand eight hundred and fifty-eight.

The condition of the above obligation is such, that if A. A. McGaffey, his heirs, executors, or administrators, do and shall well and truly execute a contract which he, the said A. A. McGaffey has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to excavate, construct, and build at his own proper cost, bridge No. 3, distributing reservoir, conduit under bank of distributing reservoir, and laying cast iron mains of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said A. A. McGaffey by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect, otherwise to remain in full force and virtue in law.

M. T. SEYMOUR. [L. S.]
D. C. McCOLLUM. [L. S.]

Signed, sealed, and delivered in presence of—
J. W. FITCH.

WASHINGTON, *June* 12, 1858.

I certify that I am acquainted with M. T. Seymour and D. C. McCollum, of the State of New York, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion sufficient sureties for the purposes mentioned in the within bond.

D. E. SICKLES.

WASHINGTON AQUEDUCT.

Contract for high service reservoir, pipe vaults, and graduation on sections 9 *and* 10.

Agreement between N. H. Decker and W. G. Wheaton, (under the style and title of Decker & Wheaton,) of Peoria, in the State of Illinois, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting under the authority of and for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

1. That the party of the first part, for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary and which may not be furnished by the United States, and to do all the work in constructing and building high service re-

servoir, pipe vaults, and graduation on sections 9 and 10, or so much as may be necessary to complete the same for the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate after the first shall be paid, unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained per centage.

6. The work shall always be open to examination during its progress by the engineers, or other persons they may depute for that purpose, and the contractor shall at all times, at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract that the work aforesaid shall be commenced within three days after the notification of the approval of this contract; that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within four months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully com-

pleted and delivered up; and it is further agreed that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then, on a certificate of the fact by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all materials furnished and work performeed, and upon which no estimate or payment may have been made, shall be forfeited to, and become the right and property of, the United States, and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss, in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not, knowingly, employ any man either as overseer, laborer, or in any situation, who shall have been dismissed by the order of the engineer from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work it shall be the duty of the contractor to take down, at his own expense, and rebuild so much thereof as shall be disapproved of; and if the contractor shall

neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer, which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be, in all its parts, subject to the terms and conditions of an act of Congress passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made." *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sub-let nor assigned, but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this fifth day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

N. H. DECKER. [L. S.]
W. G. WHEATON. [L. S.]
M. C. MEIGS, [L. S.]
Captain of Engineers, Chief Engineer Washington Aqueduct.

[Done in quadruplicate.]

Witness: Z. W. DENHAM.

Specification for graduation on sections Nos. 9 and 10 of the Washington Aqueduct.

PLAN AND DIMENSIONS OF THE AQUEDUCT.

1. The conduit will be circular, nine feet in interior diameter, to be built, generally, of three separate four-inch rings of brick—the engineer reserving the right to omit one of the brick rings at such points as he may think proper.

2. The center of the conduit will be the level of the *grade* at any point.

3. All excavations in earth for the bed of the conduit will be fourteen feet wide at the grade, unless otherwise directed, with slopes generally in earth cutting one foot base to two feet rise, and in rock of one foot base to four feet rise, but may be changed to such other slopes as in the opinion of the engineer may be found necessary or advisable.

4. The embankments for the bed of the conduit will be generally forty-four feet wide at grade, and will have outer slopes of two feet base to one foot rise. The top of the bank over the conduit will be twelve feet wide, and will be eight feet above grade; but these dimensions may be increased or diminished as the engineer may direct.

5. The excavations for the conduit trench will be cut down and the embankments for the conduit bed will be raised up to grade before the excavation is made through them for the lower semicircle, except where rock is found or supposed to be, when the contractor may be required to excavate the whole trench before any embankment shall be made.

6. *Clearing and grubbing.*—Before commencing any excavation or embankment, the ground will be cleared of all timber, wood, or brushwood for at least thirty feet on each side of the center line; and the whole base of the excavation and embankment, and as much on each side as may be required by the engineer, will be well and thoroughly grubbed, and all wood, brush, and roots removed therefrom; and, where it may be found necessary to obtain embankment from points outside of the trench, the surface will also first be grubbed.

7. The contractor for the section work will be required to preserve such timber and posts as in the opinion of the engineer may be required upon other parts of the aqueduct, and the residue, or so much as he may require, may be used by the contractor.

8. *Mucking and benching.*—The surface of the ground through which excavations are to be made and upon which embankments will be built, after being grubbed as above described, will be excavated to such depth as, in the opinion of the engineer, may be sufficient to remove all leaves, grass, soil, and mould; and this *mucking* so removed will be placed at such convenient point outside of the embankment stakes as may be directed by the engineer, that it may be used as an outer covering to the banks when finished; and where embankment shall be obtained outside of the excavation for the trench, the mucking will in like manner be first removed and disposed of as may be directed.

9. Where benching may be found necessary, the contractor will be

required to make it at such time and in such manner as the engineer may direct.

10. *Excavations.*—This is meant to include the mucking and benching, the trench for the conduit, the pits for culverts, and, where required, drains to and from them; the foundations and pits for piers and abutments of bridges and overfalls, and the construction of drains along the aqueduct.

11. The contractor will in all cases be required to excavate to such dimensions and upon such portions of the work as the engineer may direct, that the masonry and brickwork may be commenced and carried on, if necessary, at the same time with the graduation, and he will dispose of the whole or any part of the excavation as the engineer shall prescribe.

12. In side hill rock work the excavation will be done in such manner as not to shatter or disturb the rock on the outer edge of the cut, but it shall be left a firm support to the conduit. And if at any point the contractor should be allowed by the engineer to cut in horizontally at or above *grade*, the additional walling or embankment, rendered necessary in consequence, will be made at the cost of the contractor. The excavation below grade, in rock work, will be as nearly semicircular as it can be made in blasting; and in earth it shall be carefully excavated to dimensions to be prescribed by the engineer, that it may be afterwards trimmed to the size and shape required for the brick work. Where it may be deemed expedient to cut back drains, or to widen the excavation along the trench to obtain earth for embankment, the earth so obtained may, at the option of the engineer, be measured and estimated as excavation or embankment, with the proper haul, but will not be estimated as both.

13. Detached stone less than three cubic feet in size will be included in the third class of excavation, (item No. 4 of the following proposal;) all others not exceeding twenty cubic feet will be included with soft rock, (item No. 3.)

It is understood that soft or rotten rock is such as cannot be excavated by the shovel, spade, plough, or pick alone, but requires the use of a crowbar and pick to break it up, yet is not hard enough to require drilling and blasting.

Hard rock is such as requires drilling and blasting in order to be broken up.

Materials not included in the above two items will be estimated as earth or mucking.

Of this classification the engineers will be the judges; the decision of the engineer in charge will be final in case of difference between the local engineer and the contractor.

14. Where excavation is deposited in spoil bank, it shall be in good shape for moving into the back filling over the conduit.

15. Stone and rock excavated from the section work and not required in its construction shall be deposited as may be directed by the engineers, and the cost of transportation over five hundred feet shall be estimated by the engineers.

16. The price for excavation will cover the transportation five hundred feet; and this means that the whole excavation or any part of it, upon one station or chain of one hundred feet, if required, will be

hauled into embankment, rock filling, or spoil bank upon any part of the five nearest adjacent chains, on either side. The additional haul that may be required, over five hundred feet, will be proposed for at a stated price per cubic yard. The length of this additional haul will be measured from the center of the chain between any two stations whence the material is taken, to the center of the chain which is 500 feet from the place of deposit.

17. *Embankment.*—This term includes the formation of the bank in which the conduit is to rest where the ground is below grade, the covering of culverts and filling against bridges and overfalls when required by the engineer, the back filling over the conduit in cuts, as well as the covering in embankments, and the formation of roadways over and the levelling of low grounds (side filling) adjacent to the aqueduct, when required.

18. All embankments required for raising the bed of the conduit up to the level of grade will be carted in and spread in layers not exceeding three inches in depth, and, when required by the engineer, will be well rammed throughout each course, or such part thereof as may be required, before another course is laid on. The embankment required for covering the conduit both in cuts and fills will also be carefully made, where practicable, in layers as above described, and so much thereof as may be required by the engineer will be rammed. If, in lieu of ramming, it shall be deemed necessary or advisable to *puddle* the whole or any portion of the bank, the earth to be so puddled shall be spread in layers generally not exceeding six inches in depth, and each course shall be made wet, and shall be well cut with the spade or shovel into the ground or the course below, and shall be worked into a stiff and cohesive mass before another course shall be commenced. All materials required for forming embankments shall be taken from such places as the engineer shall direct.

19. No logs, trees, brush, stumps, roots, leaves, grass, or stones will be left in or admitted into any part of the embankment, and no frozen earth or clods will be admitted into any embankments below grade, or be allowed to lie near the conduit above grade.

20. The banks when finished shall be made smooth on the top and on the slopes. When the section work is otherwise completed, the soil and muck removed in preparing for the excavation and embankment, if so ordered by the engineer, will be thrown up so as to form the outer cover of the embankment, and will be trimmed to the proper slopes.

21. *Puddling.*—The puddling, when any is required by the engineer, will be regulated by him, as to quality, thickness, and disposition. It will be measured and paid for as embankment, to which the price affixed in the following proposals will be additional, it being understood to cover only the expense of cutting and working the clay to a tough and firm consistency.

22. *Ramming.*—When embankment is required to be rammed, it will be spread in courses over the whole or such portions of the work as the engineer shall direct, and shall be packed evenly and uniformly to prevent unequal settlement. Like puddling, it will be measured and estimated as embankment, to which the price affixed in the fol-

lowing proposals will be additional, it being understood to cover the expense of pounding or packing the embankment into a compact mass.

23. *Dry walling.*—Where dry walling of any kind is required, the contractor may be required to build it upon such plan, of such materials, in such manner, and at such time as the engineer shall direct, and the value thereof shall be adjudged by the engineer; but the right is reserved to the engineer to contract with other parties, or to employ persons by the day to construct the whole or any part of the walling upon any section.

24. *General Remarks.*—All "haul" of materials, whether counted as excavation or embankment, will be estimated as though they were taken from, hauled, and deposited upon the center line of the aqueduct, unless they shall be taken, by direction of the engineer, from some point over one hundred feet from the said line, in which case they will be estimated by the most direct line from the borrow pit to the center of the chain upon which they shall be required.

25. *Public and private roads.*—No public or private way shall be disturbed or obstructed, except under the special direction of the engineer, and whatever extra work is done to prevent such obstruction shall be according to the directions, and shall be paid for at the estimate of the engineer.

26. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons, objected to by the engineer, shall be retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of this rule; any violation of it will be considered sufficient ground for the engineer to declare the contract void.

27. *Extra work.*—No allowance for extra work, beyond that specified, will be made, except such as shall have been done by the special written order of the engineers. All claims for extra work must be presented to the engineer at the end of the month in which such extra work shall have been done, to be settled in the estimate of work done within that month, or they will not be considered.

All work done under these specifications will be in all respects in strict conformity with the directions of the engineers; and any work which they may require and which may not be specified will be valued by the engineer in charge; and his decision shall be final and without appeal.

28. *Monthly estimates.*—Monthly estimates will be made between the first and tenth of each month approximate of the whole amount of work done within the month, and as soon thereafter as practicable a payment will be made of nine-tenths of such estimates. But should the contractor abandon the work, or the engineer declare the contract void, all the work not paid for, as well as the retained per centage, will be forfeited to the United States.

29. No contract will be sub-let in whole or in part, but the contractors will be required to give their personal and constant attention to the work during its progress.

30. The subscriber offers to contract for graduation between stations No. —— and No. —— upon section No. nine and ten of the Washington aqueduct, at the prices mentioned in the following table, and

to complete the work according to the preceding specification, and upon the terms and conditions stipulated in the contract which he may hereafter subscribe, in the form of which a copy has been exhibited to and read by him:

GRUBBING.	EXCAVATION.			EMBANKMENT.				
1	2	3	4	5	6	7	8	9
Per acre.	Per cubic yard.	Per cubic yard.	Per cubic yard.	Haul per cubic yard. Per 100 feet.	Per cubic yard.	Haul per cubic yard. Per 100 feet.	Per cubic yard.	Per cubic yard.
Grubbing and clearing the trees, bushes, stumps, and roots, from the space required for the excavation and embankments.	Of solid rock requiring blasting.	Of soft rock and detached rock containing more than three and less than twenty cubic feet.	Of gravel, earth, and loose stone, or any material other than that described in Nos. 2 and 3.	Of materials obtained from the excavation and transported over 500 feet, in *addition to the price for excavation.*	Of materials not obtained from the excavation and hauled not over 500 feet.	Of materials not obtained from the excavation and hauled over 500 feet, in addition to No. 6.	Puddling of materials—paid as excavation or embankment, in addition to the price for excavation or embankment.	Ramming of materials—paid as excavation or embankment, in addition to the price for excavation or embankment.
$90 00	$1 40	$0 60	$0 26	$0 01¼	$0 22	$0 01¼	$0 16	$0 12

31. Signed by me this tenth day of May, 1858.

N. H. DECKER.
W. G. WHEATON.

To Captain M. C. Meigs, United States Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby, jointly and severally, covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification for pipe vault at Foundry branch.

1. The form, dimensions, &c., are shown in the drawings.
2. The site is to be excavated from the hill side and in accordance with the directions of the engineer.
3. The masonry will be of brick or rubble wall, as the engineer may select. It is to be of good hard burned brick or sound stone,

laid in accordance with the general specifications for masonry on the Washington aqueduct.

4. The prices paid for its construction will cover all costs incident to its construction, except the door, which will be furnished by the United States and built in by the contractor without extra charge.

5. The contractor for this work shall be subject to the general specifications of the Washington aqueduct for similar work.

PROPOSAL.

[N. B.—No proposal will be received unless all the blanks for prices are filled]

6. I propose to furnish all the materials not furnished by the United States, and to construct, in accordance with these specifications and the instructions and directions I may from time to time receive from the engineer, the masonry of the pipe vault at Foundry branch, and to do the necessary excavation therefor, in accordance with the contract which I may hereafter sign, a copy of which has been shown to and read by me, for the following prices:

7.	For brick work, per thousand	$5 00
8.	For excavation, per cubic yard	30
9.	For rubble work, per cubic yard	4 00
10.	Two-coat plastering, per square yard	40

11. All extra work required of me at the estimate of the engineer.

12. Bricks, cement, and sand to be furnished by the United States on the canal bank, to be hauled to the work by the contractor.

13. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, centers, machinery, and tools, not furnished by the United States, and every expense necessary to the completion of the whole of the earth work and masonry, according to the specifications and plans, and the contract I may hereafter sign, in the form a copy of which has been shown to and read by me.

14. Signed by me this tenth day of May, 185 .

N. H. DECKER.
W. G. WHEATON.

To Captain M. C. Meigs, United States Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby, jointly and severally, covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification for the high service reservoir at corner of Road and High streets, Georgetown, D. C.

1. The reservoir will consist of a covered basin of 120 feet diameter, excavated from the original surface of the ground to a depth of 20 feet; and such of the material so obtained as the engineer may deem suitable deposited in an embankment surrounding this basin or otherwise, as he may direct. This embankment is to be ten feet wide on top, and on a level with the water line; its exterior slope is to be one and a half to one, and its interior will rest against the brick work of the covering dome. The general dimensions and the construction of the whole work are shown in the drawings.

2. Embankment will be formed in layers of three inches depth, and such parts as require it shall be well rammed and puddled.

3. A puddle ditch shall be sunk on the exterior of the embankment, to such depth and of such form as the engineer shall direct; the manner of puddling to be the same as that which obtains in other parts of the Washington aqueduct.

4. The embankment will rest, on its western side, on a small revetment wall of good rubble stone, laid in hydraulic mortar; the form and dimensions of the wall to be fixed by the engineer.

5. There will be a gallery running from the street to the center of the reservoir, for the purpose of visiting and manœuvering the drain pipes and cocks. This gallery is to be lined with brick. The price paid for its excavation will be the same as for that of the basin.

6. The price paid for the excavation is to include the depositing of the same in embankment or otherwise, as the engineer may direct; also the ramming and dressing.

7. The price paid for puddling will be in addition to that paid for the excavation of the material used, which shall be the same as for other excavation.

8. The reservoir will be covered by a dome of brick work two feet in thickness, of fifty feet rise, and one hundred and twenty feet interior diameter, resting on a foundation of concrete two and a half feet deep, and five and a half feet wide. The centers for this dome to be furnished by the contractor, subject to the approval of the engineer. It may be built without centers, by using a radius bar to which to lay the bricks. The summit of the dome will be pierced by a circular aperture, and surmounted by a lantern of brick work, as shown in the drawing.

9. The brick work of this reservoir, from its base to a level one foot higher than the water line, will be lined with coal tar, dusted with cement. This tar is to be introduced between the four and a half inch course of brick on the inner face of the wall and the body of the wall. The 4½ inch course is to be tied into the body of the wall every five courses by a heading course.

10. The coal tar will be furnished and applied by the contractor.

11. The remainder of the dome will be laid in cement mortar of approved quality and proportions—the contractor furnishing the water, mortar beds, labor of mixing, &c., and the United States the materials.

12. Hoop iron will be built into the brick work, as directed by the engineer, forming a strong and sufficient bond.

13. Concrete is to be formed of clean gravel, or of sound stone or brick broken to pass through a three-inch ring, and hydraulic mortar in the proportion of one full barrel of cement to two of sand, and this thoroughly mixed on an approved platform of plank, with thirty cubic feet of broken stone.

14. It is to be spread in layers one foot thick, and well rammed.

15. The price paid for brick work per thousand, actually laid, will include all charges or expenses necessary to the construction of the dome, not expressly otherwise provided for herein.

16. For the manner of constructing the masonry, reference is made to the general specifications of masonry for the Washington aqueduct herewith.

17. Whenever the United States, through its engineer, shall deem proper to do any work not included in this agreement, but incident to the construction and completion of the reservoir, the contractor will furnish every facility within his power for the execution of the work, and without charge.

PROPOSAL.

[N. B.—No bid will be considered unless all the blanks for prices are filled.]

18. The subscriber offers to furnish all the materials not furnished by the United States, and to do the work necessary to complete the earth work and masonry for the reservoir described in these specifications; to clear away from the site, after the work is finished, all rubbish, waste or coarse materials that may have accumulated, in conformity to the plans to the preceding specifications, and to the directions he may receive from time to time from the engineer, for the following prices, to wit:

19. For all excavation, per cubic yard	$0	20
20. For puddling, additional, per cubic yard		16
21. For brick work, per thousand laid	6	00
22. For concrete, per cubic yard	3	25
23. For rubble masonry, per cubic yard	4	00
24. For hoop iron for bond, per ton of 2,240 lbs	100	00

25. Bricks, cement, and sand, furnished by the United States on the canal bank, to be hauled by the contractor.

26. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, centers, machinery, and tools not furnished by the United States, and every expense necessary to the completion of the whole of the earth work and masonry, according to the specifications and plans, and the contract I may hereafter sign, in the form a copy of which has been shown to and read by me.

27. Signed by me this tenth day of May, 1858.

N. H. DECKER,
W. G. WHEATON.

To Capt. M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby, jointly and severally, covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or

they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above-named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification of masonry—General description.

1. The various works of masonry are explained by drawings; and in the course of the work full working drawings of details will be furnished by the engineers.

2. The drawings will be strictly followed by the contractor.

3. The stone for dressed face work, for ashlar, for ring stones of arches, and generally for cut and finished work, will be of gray sandstone from the government quarry at Seneca. This quary is worked for the United States by H. L. Gallaher, and the stone is supplied at the following prices:

4. For quarrying ashlar, ring stones, steps, and other dimension stone, to be cut, per cubic foot, 18 cents.

5. For rubble for backing, per perch, 75 cents.

6. For cutting ring stones, steps, and coping, per superficial foot of surface cut, 25 cents.

7. For cutting ashlar, rock face, per superficial foot of beds and joints, 18 cents.

8. Stone delivered at the quarry on boats furnished by the contractor for masonry.

9. Stone will be delivered to the contractor and charged to him at the above rates; or he may quarry sandstone of the same color and quality elsewhere, and cut them himself. It is also left optional with him whether to receive the stone in the rough at the first named rate and cut them himself, or to receive them ready cut at the rates specified.

10. Rubble stone for backing will be of hard blue stone or gneiss from the quarries near the line of the aqueduct and canal.

11. *Masonry.*—To be built of sound, well-shaped, and durable stone, or hard, well-burned brick, laid in full beds of mortar, composed of clean sharp sand and hydraulic cement.

12. The joints of mortar should not be more than three-eighths of an inch in thickness in brick work, and half an inch in stone. Iron clamps will be furnished by the United States, but the contractor will be required to build them into the masonry. The stones will be set carefully and accurately. The whole of the masonry will be laid in flush mortar and grouted, so as to insure every joint to be filled solid with cement mortar or grout.

13. Spandrels, abutments, and foundation walls will be of the best quality of rock face masonry, built with stones not less than six inches thick nor less than eighteen inches bed; every stone less than two feet in thickness to have at least one-half more bed than rise; over that thicknees it is sufficient that its bed and rise are the same. The bond shall in no case be less than eighteen inches; there shall be at least one header in every eight feet of a course, and no stone shall be considered as a header that is less than four feet in length. In spandrels and backing the stones in contact with the arch will be laid for the depth designated in the drawings, with their beds conforming to the radius lines of the arch.

14. Where masonry or concrete is laid upon or against rock, the rock must be first freed from all earthy matter by scraping and washing, and all irregularities and projections removed, so as to bring it to a uniform surface; it will also be kept wet at the time of laying the masonry, and all holes and depressions will be filled with concrete or with spalls, forced into full beds of mortar, and the stones forming the first course will be selected of the largest size. The stone used in masonry should be kept wet, and free from any dirt that would prevent the adherence of the cement.

15. No foundation shall be built upon until it shall have been seen and approved of by the engineer in charge.

16. The coping of bridges will be built into the abutment and spandrel walls, having a wash on top, and a drip channel underneath two inches from the outer edge, as shown on the plan; the stone will be rough hammer-dressed, with joints of three-eighths of an inch, not less than three feet wide, and will be secured with iron dowels and clamps, and copper gutters under the joints, as shall be directed by the engineer; the dowels and clamps and copper will be furnished by the United States. The price paid for coping will include any drilling or other preparation that may be necessary for their application.

17. The United States reserve the right to furnish the stone for the work in whole or in part, to be delivered upon the berme bank of the Chesapeake and Ohio canal, adjacent to the work.

18. Concrete shall consist of broken stone or brick and cement mortar, in the proportions of one barrel of cement and two of sand to 30 cubic feet of broken stone or brick; the stone to be measured with care, and well mixed with cement in the above proportions on a platform of plank, convenient to the work, from which it may be shovelled or carried on a wheelbarrow to the place where it is to be used; and after being deposited and spread in layers one foot thick, it shall be rammed with wooden rammers until it is brought into a compact state.

19. The stone or brick for concrete shall be broken into fragments not exceeding half a pound in weight; but whenever concrete is used in large masses, stones containing from 2 to 20 cubic feet may be deposited in it, care being taken that such stones rest on a good bed, and are far enough apart to allow the rammers to pass between them, and insure the complete contact of the concrete with them.

20. When concrete is placed in contact with rock, the rock must be first scraped and washed.

21. The mortar used for masonry shall consist of one part of cement

to two parts of clean sharp sand, to be first mixed dry, and afterwards water to be added as wanted, in small quantities; it shall be mixed upon an approved bed, formed of plank, under shelter from the sun and rain, and the time between the first wetting of the cement and its being used in the work shall never exceed one-half hour.

22. The cement will be furnished by the United States, and will be hauled by the contracter, at his own cost, from some one of the deposits of cement which shall be established by the United States on the bank of the canal, upon the written orders which he shall, from time to time, receive from the engineer for the same, and the engineer shall be the sole judge as to which deposit it shall be taken from, and shall express the same in said orders; the quantity drawn shall not, in any case, exceed 300 pounds to each yard of stone laid, nor 600 pounds to each 1,000 of brick laid. Any excess over this will be charged to said contractor, at the rate of 50 cents per 100 pounds. Any unnecessary waste of cement or sand, detected by the engineer, will also be charged against the contractor—the cement at the same rate of 50 cents per 100 pounds, and the sand at its value; and this whether the prescribed quantity be used in the work or not; and of the proper care to be exercised by the contractor the engineer shall be the sole judge.

23. The contractor will be required to keep the cement dry and secure from the weather until used, and return the bags in which it was furnished in good order.

24. Clean sharp sand will be contracted for with other parties by the United States, and will be delivered upon the berme bank of the Chesapeake and Ohio canal, at some convenient point near the work, and will be transported to the work by the contractor, at his own cost. And the contractor will be required to pass it through a fine screen before using.

25. Bricks have been contracted for with other parties, and will be furnished delivered upon the banks of the canal or at some other point equally convenient, and will be transported to the work by the contractor for masonry.

26. *Centering.*—Centers will be furnished by the United States, delivered upon the berme bank of the Chesapeake and Ohio canal, to be transported to the work by the contractor, at his own cost, and will be set by the United States.

27. It is expressly stipulated that although the United States agree to furnish the materials above named, yet that if, from any cause, there should be delay or failure on the part of the said United States, there shall not be any claim for damages on the part of said contractors against the United States.

28. The United States will contract with other parties to do the necessary excavation for the foundation; but the preparation of the rock to receive the masonry, as directed in the specifications, by removing projections, cleaning, &c., will be done by the contractor for the masonry, such work being included in the cost of laying the masonry.

29. The contractor shall clear away from the whole breadth of the aqueduct any coarse material that he may have brought upon it during the construction of his work.

work done pursuant to this contract at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate after the first shall be paid unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained per centage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that purpose, and the contractor shall at all times at his own expense keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract that the work aforesaid shall be commenced within three days after the notification of the approval of this contract; that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within twelve months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then on a certifi-

cate of the fact by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States, and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss, in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed by the order of the engineer from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer, which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before

the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular, the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this ninth day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

ROBERT McINTYRE, [L. S.]
M. C. MEIGS, [L. S.]
Captain of Engineers, Chief Engineer Washington Aqueduct.

[Done in quadruplicate.]

Witnesses as to Robert McIntyre—
JOHN D. STILES,
J. M. PORTER.

Witness as to signature of Captain Meigs—
Z. W. DENHAM.

EASTON, PENNSYLVANIA, *June* 9, 1858.

DEAR SIR: Mr. McIntyre has signed the necessary papers for formally completing his contract for a portion of the work on the Washington aqueduct.

The sureties named in his bond are gentlemen amply responsible for much more than the sum named in the penalty, and are both personally well known to the Hon. Samuel A. Bridge, formerly the representative in Congress from the Bucks and Lehigh district, and myself; and they are also well known by reputation to the Hon. W. H. Dimmick, the present representative from the Northampton, Carbon, &c., district, who, if necessary, can add his testimonial as to their ability. There is no United States commissioner nearer than Philadelphia, and no one even there, who knows both the sureties personally. Mr. McIntyre himself is worth more than the penalty of the bond, and Judge Packer is worth more than a quarter of million of dollars. Mr. Kramer is, I think, worth the amount of the penalty.

Very respectfully, yours,

J. M. PORTER.

Captain M. C. MEIGS,
Superintending, &c.

WASHINGTON AQUEDUCT.

Specification of the manner of constructing Bridge No. 4 across the valley of Cabin John creek.

1. This bridge will be built of gray Seneca sandstone, of blue gneiss, and of hard, well-burned brick, all laid in cement mortar.

2. For the manner of constructing the masonry, reference is made to the general specifications for masonry herewith, and to the work already done on bridges of the aqueduct.

3. The arch will be constructed of dressed Quincy granite, to be furnished by parties with whom the United States has already contracted. This cut stone arch will spring from abutments of dressed Port Deposit granite already on hand.

4. The foundations will be of concrete. The abutment walls to be rock-faced ashlar, with rubble backing.

5. The cut stone arch will be backed by a rubble arch of gray Seneca sandstone flagging, in slabs not more than ten inches thick, and of suitable beds, laid radial to the arch.

6. The spandrels to be of rock-faced ashlar, with rubble backing.

7. The water table and the platform or roof of the bridge to be of stone, cut and laid according to the drawings and plans.

8. The abutments and spandrels will be built hollow, with relieving arches and piers in the centre. The abutment walls below the water table will be constructed of blue gneiss.

9. All the remainder of the face work, the arched backing, the water table, and the platform, will be of Seneca sandstone, except the arch of granite and the abutment below the springing line, of Port Deposit granite. The backing of walls will be of blue gneiss, quarried at the site of the bridge.

10. The platform or roof of the bridge will be composed of slabs of Seneca gray sandstone, nine inches in thickness, and two and a half to four feet in width, cut and laid according to the drawings, with close joints, and secured by dowels and clamps at the sides and ends.

11. Grooves will be cut on their upper surface, as shown on the lans, to carry off the water from the joints.

12. These stones will be well bedded in mortar and grouted, and afterwards the vertical joints will be cleaned out to a depth of three inches, and filled with asphaltic mastic.

13. The conduit through the bridge will be constructed of brick, as directed by the general specifications for masonry herewith.

14. The work has been commenced, the centre erected, machinery prepared and set up, and houses for the accommodation of the workmen built, and materials collected on the ground.

15. The contractor will be charged with the materials delivered, but not yet used in the work, at cost.

16. The machinery, houses, and other accessory works prepared for the construction of the bridge, will be at his disposal, he being held responsible for their return, on completion of the work, in good condition, ordinary wear and tear excepted. Any damage, injury, or loss which they may have suffered will be charged against the contractor on final settlement of his contract.

17. The centre will be taken down by the contractor, as directed by the engineer, and the timber properly piled up for removal.

PROPOSAL.

[N. B.—No bid will be considered unless the blank for each price be filled.]

18. I offer to furnish all the materials not furnished by the United States, to cut the stone, to lay the masonry, and transport the materials to the site, and to do all the work necessary to complete the bridge described in the preceding specifications, and to clear away, after the work is finished, all rubbish, stone, and coarse material that may have accumulated about the site, in conformity to the specifications herewith, and to the directions from time to time received from the engineer, for the following prices, to wit:

19.	For cutting rock-face ashlar, per superficial foot of cutting	$0 20
20.	For cutting stone for coping and platform, per superficial foot of cutting	0 25
21.	For furnishing Seneca gray sandstone for cut work, per cubic foot	0 15
22.	For furnishing rubble stone for backing, per cubic yard	2 50
23.	For laying stone masonry, including transportation of stone, cement, and sand from the bank of the canal, where delivered, to the work, per cubic yard	2 50

24. For laying bricks, including transportation, as in the preceding item, per thousand $5 00
25. For concrete, including furnishing stone and transportation, as in preceding item, per cubic yard..... 5 00
26. For furnishing wrought-iron clamps, per pound..... 0 12½

27. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, machinery, and tools, not furnished by the United States, and every expense necessary to the completion of the whole work, according to the specifications and plans, and the contract which I may hereafter sign, in the form a copy of which has been shown to and read by me.

28. Signed by me, this 11th day of May, 1858.

ROBERT McINTYRE.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of ——, in the State of ——, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of —— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said —— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said —— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification of Masonry—General description.

1. The various works of masonry are explained by drawings, and in the course of the work full working drawings of details will be furnished by the engineers.

2. The drawings will be strictly followed by the contractor.

3. The stone for dressed face work, for ashlar, for ring stones of arches, and generally for cut and finished work, will be of gray sandstone from the government quarry at Seneca. This quarry is worked for the United States by H. L. Gallaher, and the stone is supplied at the following prices:

4. For quarrying ashlar, ring stones, steps, and other dimension stone, to be cut, per cubic foot..... $0 18
5. For rubble for backing, per perch..... 75

6. For cutting ring stones, steps, and coping, per superficial foot of surface cut..... 25
7. For cutting ashlar, rock face, per superficial foot of beds and joints..... 18
8. Stone delivered at the quarry on boats furnished by the contractor for masonry.

9. Stone will be delivered to the contractor, and charged to him at the above rates; or he may quarry sandstone of the same color and quality elsewhere, and cut them himself. It is also left optional with him whether to receive the stone in the rough at the first-named rate, and cut them himself, or to receive them ready cut at the rates specified.

10. Rubble stone for backing will be of hard blue stone or gneiss from the quarries near the line of the aqueduct and canal.

11. *Masonry*—to be built of sound, well-shaped, and durable stone, or hard, well-burned brick, laid in full beds of mortar, composed of clean, sharp sand and hydraulic cement.

12. The joints of mortar should not be more than three-eighths of an inch in thickness in brick work, and half an inch in stone. Iron clamps will be furnished by the United States, but the contractor will be required to build them into the masonry. The stones will be set caerfully and accurately. The whole of the masonry will be laid in flush mortar and grouted, so as to insure every joint to be filled solid with cement mortar or grout.

13. Spandrels, abutments, and foundation walls will be of the best quality of rock face masonry, built with stones not less than six inches thick, nor less than eighteen inches bed; every stone less than two feet in thickness to have at least one-half more bed than rise; over that thickness, it is sufficient that its bed and rise are the same. The bond shall in no case be less than eighteen inches; there shall be at least one header in every eight feet of a course, and no stone shall be considered as a header that is less than four feet in length. In spandrels and backing, the stones in contact with the arch will be laid for the depth designated in the drawings, with their beds conforming to the radius lines of the arch.

14. Where masonry or concrete is laid upon or against rock, the rock must be first freed from all earthy matter by scraping and washing, and all irregularities and projections removed, so as to bring it to a uniform surface; it will also be kept wet at the time of laying the masonry, and all holes and depressions will be filled with concrete or with spalls, forced into full beds of mortar, and the stones forming the first course will be selected of the largest size. The stone used in masonry should be kept wet, and free from any dirt that would prevent the adherence of the cement.

15. No foundation shall be built upon until it shall have been seen and approved of by the engineer in charge.

16. The coping of bridges will be built into the abutment and spandrel walls, having a wash on top and a drip channel underneath, two inches from the outer edge, as shown on the plan; the stone will be rough hammer-dressed, with joints of three-eighths of an inch, not less than three feet wide, and will be secured with iron dowels and clamps,

and copper gutters under the joints, as shall be directed by the engineer; the dowels and clamps and copper will be furnished by the United States. The price paid for coping will include any drilling or other preparation that may be necessary for their application.

17. The United States reserve the right to furnish the stone for the work, in whole or in part, to be delivered upon the berm bank of the Chesapeake and Ohio canal, adjacent to the work.

18. Concrete shall consist of broken stone, or brick, and cement mortar, in the proportions of one barrel of cement and two of sand to thirty cubic feet of broken stone or brick; the stone to be measured with care and well mixed with cement in the above proportions, on a platform of plank, convenient to the work, from which it may be shoveled or carried on a wheelbarrow to the place where it is to be used; and after being deposited and spread in layers one foot thick, it shall be rammed with wooden rammers until it is brought into a compact state.

19. The stone or brick for concrete shall be broken into fragments not exceeding half a pound in weight; but, whenever concrete is used in large masses, stones containing from two to twenty cubic feet may be deposited in it, care being taken that such stones rest on a good bed, and are far enough apart to allow the rammers to pass between them, and insure the complete contact of the concrete with them.

20. When concrete is placed in contact with rock, the rock must be first scraped and washed.

21. The mortar used for masonry shall consist of one part of cement to two parts of clean sharp sand, to be first mixed dry, and afterwards water to be added as wanted, in small quantities; it shall be mixed upon an approved bed, formed of plank, under shelter from the sun and rain, and the time between the first wetting of the cement and its being used in the work shall never exceed one half-hour.

22. The cement will be furnished by the United States, and will be hauled by the contractor, at his own cost, from some one of the deposits of cement which shall be established by the United States on the bank of the canal, upon the written orders which he shall from time to time receive from the engineer for the same, and the engineer shall be the sole judge as to which deposit it shall be taken from, and shall express the same in said orders; the quantity drawn shall not in any case exceed 300 pounds to each yard of stone laid, nor 600 pounds to each 1,000 of brick laid. Any excess over this will be charged to said contractor, at the rate of fifty cents per 100 pounds. Any unnecessary waste of cement or sand, detected by the engineer, will also be charged against the contractor—the cement at the same rate of fifty cents per 100 pounds, and the sand at its value; and this whether the prescribed quantity be used in the work or not; and of the proper care to be exercised by the contractor, the engineer shall be the sole judge.

23. The contractor will be required to keep the cement dry and secure from the weather until used, and return the bags in which it was furnished in good order.

24. Clean sharp sand will be contracted for with other parties by the United States, and will be delivered upon the berme bank of the

Chesapeake and Ohio canal, at some convenient point near the work, and will be transported to the work by the contractor, at his own cost. And the contractor will be required to pass it through a fine screen before using.

25. Bricks have been contracted for with other parties, and will be furnished delivered upon the banks of the canal, or at some other point equally convenient, and will be transported to the work by the contractor for masonry.

26. *Centering* —Centres will be furnished by the United States, delivered upon the berm bank of the Chesapeake and Ohio canal, to be transported to the work by the contractor, at his own cost, and will be set by the United States.

27. It is expressly stipulated that although the United States agree to furnish the materials above named, yet that if, from any cause, there should be delay or failure on the part of the said United States, there shall not be any claim for damages on the part of said contractors against the United States.

28. The United States will contract with other parties to do the necessary excavation for the foundation; but the preparation of the rock to receive the masonry, as directed in the specifications, by removing projections, cleaning, &c., will be done by the contractor for the masonry, such work being included in the cost of laying the masonry.

29. The contractor shall clear away from the whole breadth of the aqueduct any coarse material that he may have brought upon it during the construction of his work.

30. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons, objected to by the engineer, retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of these rules; any violation of them will be considered sufficient ground for the engineer to declare the contract void.

31. The contractor will be required to give his personal and constant attention to the work during its progress.

32. The materials and workmanship shall be of the best quality, shall be subject to the inspection of the engineer in charge, or such person as he may appoint, and drawings will be furnished by him of all the details of the work, and such directions given as may be necessary to insure its construction in accordance with the plan contemplated in these specifications.

33. Any work not satisfactory to the engineer will be taken down by the contractor and rebuilt at his own expense.

34. The masonry of the side walls of bridges will be laid in proper shape to receive the brick lining of the conduit, and plastered on the inside with cement mortar. This plastering will then be covered with a coat of thick boiled coal tar and dry cement. The outer ring of brick will then be laid in cement mortar up to grade. This will be lined by the United States with asphaltic mastic, for greater security against leakage. The inner lining, or ring of brick will then be laid by the contractor up to grade, the centres placed, and the inner ring

of the upper arch or curve of the conduit laid and plastered with hydraulic cement; a coat of asphaltic mastic will then be applied to the extrados of the brick arch; the remainder of the arch will be turned and covered with thick boiled coal tar and cement, and the masonry laid over it.

Know all men by these presents, that we, Robert McIntyre, of the borough of Catasauque in the county of Lehigh, Charles Kramer, of the borough of Allentown, in the county of Lehigh, and Asa Packer, of the borough of Mauch Chunk, in the county of Carbon, all in the State of Pennsylvania, are held and firmly bound unto the United States of America in the full and just sum of forty thousand dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this ninth day of June, anno Domini one thousand eight hundred and fifty-eight: The condition of the above obligation is such that if Robert McIntyre, his heirs, executors, or administrators, do and shall well and truly execute a contract which he the said Robert McIntyre has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to excavate, construct, and build at his own proper cost, bridge No. 4, across the valley of Cabin John creek, of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said Robert McIntyre by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect; otherwise to remain in full force and virtue in law.

ROBERT McINTYRE, [L. S.]
CHAS. KRAMER, [L. S.]
ASA PACKER, [L. S.]

Signed, sealed, and delivered in presence of—
As to the signatures of Robert McIntyre and Charles Kramer—
J. M. PORTER,
JOHN D. STILES.
As to the signature of Asa Packer—
J. M. PORTER,
ROB'T H. SAYRE.

JUNE 9, 1858.

We certify that we are acquainted with Charles Kramer and Asa Packer, of ———, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and, in our opinion, sufficient sureties for the purposes mentioned in the within bond.

SAM. A. BRIDGES,
J. M. PORTER.

I concur in the above,

W. H. DIMMICK.

WASHINGTON AQUEDUCT.

Contract for waste-weir in tunnel 4.

Agreement between P. Crowley, of Washington city, District of Columbia, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting under the authority of and for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth :

1. That the party of the first part for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary and which may not be furnished by the United States, and to do all the work in constructing and building waste-weir in tunnel 4, or so much as may be necessary to complete the same, of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding. and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate, shall be paid by the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate after the first shall be paid, unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed, and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained per centage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that pur-

pose, and the contractor shall at all times, at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work, of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract, that the work aforesaid shall be commenced within three days after the notification of the approval of this contract, that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within twelve months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed, that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then on a certificate of the fact, by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States, and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same, in any place, or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss, in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed by the order of the engineer from any other part of the work for bad workmanship, intemperance, or disorderly conduct.

Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense, and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer, which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced, and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed, that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above-recited party

of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular, the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this second day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858.)

P. CROWLEY, [SEAL.]
M. C. MEIGS, [SEAL.]
Captain of Engineers
Chief Engineer Washington Aqueduct.

[Done in quadruplicate.]

Witness—
JOS. S. RIDER.

Witness to signature of Captain Meigs—
WM. G. MOORE.

WASHINGTON AQUEDUCT.

Specifications for waste-weir in tunnel 4.

1. The form and dimensions of the work are explained by the drawings.

2. The sides of the excavations will be made as smooth and even as the ground will admit of, and in the measurement the prescribed dimensions only will be considered.

3. In such parts of the drift as may require arching, the contractor will excavate to such dimensions as the engineer may deem necessary.

4. The materials from the excavations will be disposed of as the engineer may direct, and the price per yard will cover the haul two hundred feet from the end of tunnel No. 4, and also from the lower end of the drift.

5. For masonry, see general specifications.

6. The cast and wrought iron of the gates to be of good quality, free from flaws, and properly fitted. All work not specified to be done at the estimate of the engineer.

PROPOSAL.

[N. B.—No proposal will be considered unless every blank in the prices is filled by the bidder.]

7. The subscriber offers to contract to excavate and arch the waste-weir in tunnel No. 4, at the prices mentioned in the following table,

and to complete the work according to the foregoing specifications and the directions received from the engineer, and upon the terms and conditions stipulated in the contract which he may hereafter subscribe in the form which has been shown to and read by him.

8.	For excavation of chambers, per cubic yard.....	$1 50
9.	For excavation of drift, per cubic yard	6 00
10.	For rubble masonry laid, per cubic yard.....	6 00
11.	For brick masonry laid, per cubic yard.....	7 50
12.	For each valve and frame, complete in place	100 00

13. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, machinery, and tools not furnished by the United States, and every expense necessary to the completion of the whole work, according to the specifications and plans, and the contract which I may hereafter sign, in the form a copy of which has been shown to and read by me.

14. Signed by me, this 10th day of May, 1858.

P. CROWLEY.

To Captain M. C. Meigs, United States Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidder.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification of masonry.—General description.

1. The various works of masonry are explained by drawings, and in the course of the work full working drawings of details will be furnished by the engineers.

2. The drawings will be strictly followed by the contractor.

3. The stone for dressed face work, for ashlar, for ring stones of arches, and generally for cut and finished work, will be of gray sandstone from the government quarry at Seneca. This quarry is worked for the United States by H. L. Gallaher, and the stone is supplied at the following prices:

4. For quarrying ashlar, ring stones, steps, and other dimension stone to be cut, per cubic foot $0 18
5 For rubble for backing, per perch..... 75
6. For cutting ring stones, steps, and coping, per superficial foot of surface cut..... 25
7. For cutting ashlar, rock face, per superficial foot of beds and joints..... 18

8. Stone delivered at the quarry on boats furnished by the contractor for masonry.

9. Stone will be delivered to the contractor and charged to him at the above rates; or he may quarry sandstone of the same color and quality elsewhere and cut them himself. It is also left optional with him whether to receive the stone in the rough at the first-named rate, and cut them himself, or to receive them ready cut at the rates specified.

10. Rubble stone, for backing, will be of hard blue stone or gneiss, from the quarries near the line of the aqueduct and canal.

11. *Masonry*, to be built of sound, well-shaped, and durable stone, or hard, well-burned brick, laid in full beds of mortar, composed of clean, sharp sand and hydraulic cement.

12. The joints of mortar should not be more than three-eighths inch in thickness in brick work and half an inch in stone. Iron clamps will be furnished by the United States, but the contractor will be required to build them into the masonry. The stones will be set carefully and accurately. The whole of the masonry will be laid in flush mortar and grouted, so as to insure every joint to be filled solid with cement mortar or grout.

13. Spandrels, abutments, and foundation walls will be of the best quality of rock face masonry, built with stones not less than six inches thick, not less than 18 inches bed; every stone less than two feet in thickness to have at least one-half more bed than rise; over that thickness it is sufficient that its bed and rise are the same. The bond shall in no case be less than 18 inches; there shall be at least one header in every 8 feet of a course, and no stone shall be considered as a header that is less than 4 feet in length. In spandrels and backing, the stones in contact with the arch will be laid for the depth designated in the drawings, with their beds conforming to the radius lines of the arch.

14. Where masonry or concrete is laid upon or against rock the rock must be first freed from all earthy matter by scraping and washing, and all irregularities and projections removed, so as to bring it to a uniform surface; it will also be kept wet at the time of laying the masonry, and all holes and depressions will be filled with concrete or with spalls, forced into full beds of mortar, and the stones forming the first course will be selected of the largest size. The stone used in masonry should be kept wet, and free from any dirt that would prevent the adherence of the cement.

15. No foundation shall be built upon until it shall have been seen and approved of by the engineer in charge.

16. The coping of bridges will be built into the abutment and

spandrel walls, having a wash on top, and a drip channel underneath, two inches from the outer edge, as shown on the plan; the stone will be rough hammer-dressed, with joints of three-eighths of on inch, not less than three feet wide, and will be secured with iron dowels and clamps, and copper gutters under the joints, as shall be directed by the engineer; the dowels and clamps and copper will be furnished by the United States. The price paid for coping will include any drilling or other preparation that may be necessary for their application.

17. The United States reserve the right to furnish the stone for the work, in whole or in part, to be delivered upon the berme bank of the Chesapeake and Ohio canal, adjacent to the work.

18. Concrete shall consist of broken stone or brick and cement mortar, in the proportions of one barrel of cement and two of sand to 30 cubic feet of broken stone or brick; the stone to be measured with care, and well mixed with cement in the above proportions on a platform of plank, convenient to the work, from which it may be shovelled or carried on a wheelbarrow to the place where it is to be used; and after being deposited and spread in layers one foot thick, it shall be rammed with wooden rammers until it is brought into a compact state.

19. The stone or brick for concrete shall be broken into fragments not exceeding half a pound in weight; but whenever concrete is used in large masses, stones containing from 2 to 20 cubic feet may be deposited in it, care being taken that such stones rest on a good bed, and are far enough apart to allow the rammers to pass between them, and insure the complete contact of the concrete with them.

20. When concrete is placed in contact with rock, the rock must be first scraped and washed.

21. The mortar used for masonry shall consist of one part of cement to two parts of clean sharp sand, to be first mixed dry, and afterwards water to be added as wanted, in small quantities; it shall be mixed upon an approved bed, formed of plank, under shelter from the sun and rain, and the time between the first wetting of the cement and its being used in the work shall never exceed one-half hour.

22. The cement will be furnished by the United States, and will be hauled by the contractor, at his own cost, from some one of the deposits of cement which shall be established by the United States on the bank of the canal, upon the written orders which he shall from time to time receive from the engineer for the same, and the engineer shall be the sole judge as to which deposit it shall be taken from, and shall express the same in said orders; the quantity drawn shall not, in any case, exceed 300 pounds to each yard of stone laid, nor 600 pounds to each 1,000 of brick laid. Any excess over this will be charged to said contractor at the rate of 50 cents per 100 pounds. Any unnecessary waste of cement or sand detected by the engineer will also be charged against the contractor—the cement at the same rate of 50 cents per 100 pounds, and the sand at its value, and this whether the prescribed quantity be used in the work or not; and of the proper care to be exercised by the contractor the engineer shall be the sole judge.

23. The contractor will be required to keep the cement dry and

secure from the weather until used, and return the bags in which was furnished in good order.

24 Clean sharp sand will be contracted for with other parties by the United States, and will be delivered upon the berme bank of the Chesapeake and Ohio canal, at some convenient point near the work, and will be transported to the work by the contractor at his own cost. And the contractor will be required to pass it through a fine screen before using.

25. Bricks have been contracted for with other parties, and will be furnished delivered upon the banks of the canal, or at some other point equally convenient, and will be transported to the work by the contractor for masonry.

26. *Centering.*—Centers will be furnished by the United States, delivered upon the berme bank of the Chesapeake and Ohio canal, to be transported to the work by the contractor at his own cost, and will be set by the United States.

27. It is expressly stipulated that although the United States agree to furnish the materials above named, yet that if from any cause there should be delay or failure on the part of the said United States, there shall not be any claim for damages on the part of said contractor against the United States.

28. The United States will contract with other parties to do the necessary excavation for the foundation; but the preparation of the rock to receive the masonry, as directed in the specifications, by removing projections, cleaning, &c., will be done by the contractor for the masonry, such work being included in the cost of laying the masonry.

29. The contractor shall clear away from the whole breadth of the aqueduct any coarse material that he may have brought upon it during the construction of his work.

30. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons, objected to by the engineer, retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of these rules. Any violation of them will be considered sufficient ground for the engineer to declare the contract void.

31. The contractor will be required to give his personal and constant attention to the work during its progress.

32. The materials and workmanship shall be of the best quality, shall be subject to the inspection of the engineer in charge, or such person as he may appoint, and drawings will be furnished by him of all the details of the work, and such directions given as may be necessary to insure its construction in accordance with the plan contemplated in these specifications.

33. Any work not satisfactory to the engineer will be taken down by the contractor and rebuilt at his own expense.

34. The masonry of the side walls of bridges will be laid in proper shape to receive the brick lining of the conduit, and plastered on the inside with cement mortar. This plastering will then be covered with a coat of thick boiled coal car and dry cement. The outer ring of

brick will then be laid in cement mortar up to grade. This will be lined by the United States with asphaltic mastic for greater security against leakage. The inner lining or ring of brick will then be laid by the contractor up to grade, the centres placed, and the inner ring of the upper arch or curve of the conduit laid and plastered with hydraulic cement; a coat of asphaltic mastic will then be applied to the extrados of the brick arch; the remainder of the arch will be turned and covered with thick boiled coal tar and cement, and the masonry laid over it.

Know all men by these presents that we, John Crumbaugh and Samuel Duvall, of Washington city, District of Columbia, are held and firmly bound unto the United States of America in the full and just sum of two thousand dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this 2d day of June, anno Domini one thousand eight hundred and fifty-eight. The condition of the above obligation is such, that if Patrick Crowley, his heirs, executors, or administrators, do and shall well and truly execute a contract which he, the said Patrick Crowley, has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to excavate, construct, and build at his own proper cost, waste-weir in tunnel No. 4 of the Washington aqueduct, according to the specifications and such directions as may, from time to time, be given to said Patrick Crowley by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect, otherwise to remain in full force and virtue in law.

JOHN CRUMBAUGH. [L. S.]
SAMUEL DUVALL. [L. S.]

Signed, sealed, and delivered in presence of—
JOS. S. RIDER,
J. W. SOTHORON.

UNITED STATES COMMISSIONER'S OFFICE,
June 2, 1858.

I certify that I am acquainted with John Crumbaugh and Samuel Duvall, of the county of Washington, District of Columbia, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and, in my opinion, sufficient sureties for the purposes mentioned in the within bond.

H. C. MATTHEWS,
Collector of the Customs, Georgetown, D. C.

WASHINGTON AQUEDUCT.

Contract for effluent gate-house and sluice gate-house of the receiving reservoir.

Agreement between H. L. Gallaher, of the State of Virginia, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting under the authority of and for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, *witnesseth:*

1. That the party of the first part, for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary, and which may not be furnished by the United States, and to do all the work in constructing and building effluent gate-house and sluice gate-house of the receiving reservoir, or so much as may be necessary to complete the same of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due, for work performed since the preceding estimate, shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate after the first shall be paid unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed, and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained percentage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that purpose, and the contractor shall at all times, at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract that the work aforesaid shall be commenced within three days after the notification of the approval of this contract, that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within six months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed that, in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as, in the opinion of the engineer, shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then, on a certificate of the fact by the principal assistant engineer made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved percentage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the rght and property of the United States, and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties that, in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss, in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any

man, either as overseer, laborer, or in any situation, who shall have been dismissed by the order of the engineer, from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all oders given by an engineer, which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided also*, That it is expressly understood and agreed that this contract, nor any part

thereof, shall not be sub-let nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this twelfth day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

H. L. GALLAHER, [L. S.]
M. C. MEIGS, [L. S.]
Captain for Engineers, Chief Engineer Washington Aqueduct.

[Done in quadruplicate.]
Witness as to signature of H. L. Gallaher—
WILLIAM G. MOORE.
Z. W. DENHAM,
As to signature of Captain Meigs.

WASHINGTON AQUEDUCT.

Specification for effluent gate-house and for sluice gate-house of the receiving reservoir.

1. The structures are explained by the drawings.

2. The excavation for the foundation will be made by the contractor for the reservoir.

3. For the details of the masonry not specially described here the general specifications for masonry are referred to.

4. For the superstructure the stone must be cut smooth and sanded.

5. The roofs will be covered with slate one-quarter of an inch thick, with edges cut to pattern, and laid in cement mortar, as shown by the drawings.

6. All coping and cornice to be clamped with cast-iron dowels furnished by the United States.

7. The dome and backing of cut stone in superstructure to be of brick.

8. *Centering.*—The conduit centers in this work will be furnished by the United States. All other centers by the contractor.

9. Patent vault lights and frames, as well as any iron or timber furnished by the United States, will be built into the work by the contractor, as directed by the engineer.

10. The gates will be furnished by other contractors. The price for masonry to cover all workmanship, drilling, &c., necessary to secure the gates in their places.

11. The work having been commenced, all materials which it may be the business of the contractor to furnish, but which may have been provided for the work, but not used at the time the work is assumed by him, will be charged to him at cost.

PROPOSAL.

(N. B.—No bid will be considered unless all the blanks for prices are filled.)

12. I offer to furnish all the materials not furnished by the United States, to cut and rub the stone, to lay the masonry, transport the materials to the site, set and secure properly all the iron work, gates, beams, clamps, doors, and other things necessary to complete the gate-house described in the preceding specifications, to make the puddle and embankments, and to clear away all rubbish, or waste, or coarse material that may have accumulated about the site, for the following prices, to wit:

13. For furnishing Seneca gray sandstone for face work, per cubic foot	$0 27
14. For furnishing rubble stone for backing, per cubic yard.	2 12½
15. For rough cutting stone for foundations and substructure, per superficial foot of surface cut	18
16. For fine cutting and rubbing, per superficial foot of exterior face of walls, cut fine and rubbed	1 65
17. For cutting and rubbing base-moulding, per lineal foot.	82½
18. For cutting and rubbing entablature, consisting of architrave, frieze, and cornice, per lineal foot	14 85
19. For lantern on top of dome, complete	450 00
20. For cutting door mouldings, per lineal foot, fine cut and sanded	2 00
21. For slating, per square of 100 square feet	15 00
22. For cast-iron and glass vault light in lantern, per square foot	2 25
23. For concrete, including furnishing stone, per cubic yard.	4 00
24. For laying stone masonry, per cubic yard	4 25
25. For laying bricks, per cubic yard	4 00
26. For cast-iron doors, with hinges and locks complete, according to the drawing to be furnished, per pound	9½
27. For timber in stop plank, per 1,000 feet board measure.	65 00
28. For embankment, per cubic yard	25
29. For puddling, per cubic yard, additional	15

30. The above prices include all materials not specified as furnished by the United States, all hauling, carts, machinery, tools, scaffolding, workmanship, and every expense necessary to complete the gate-house and its fixtures ready for use, except centers, which will be furnished by the United States, on the bank of the canal, but set up at the expense of the contractor, and removed by him.

31. Signed by me this 11th day of May, 1858.

H. L. GALLAHER.

or carried on a wheelbarrow to the place where it is to be used, and after being deposited and spread in layers one foot thick it shall be rammed with wooden rammers until it is brought into a compact state.

19. The stone or brick for concrete shall be broken into fragments not exceeding half a pound in weight; but whenever concrete is used in large masses, stones containing from two to twenty cubic feet may be deposited in it, care being taken that such stones rest on a good bed and are far enough apart to allow the rammers to pass between them and insure the complete contact of the concrete with them.

20. When concrete is placed in contact with rock, the rock must be first scraped and washed.

21. The mortar used for masonry shall consist of one part of cement to two parts of clean sharp sand, to be first mixed dry and afterwards water to be added as wanted in small quantities; it shall be mixed upon an approved bed, formed of plank, under shelter from the sun and rain, and the time between the first wetting of the cement and its being used in the work shall never exceed one half-hour.

22. The cement will be furnished by the United States, and will be hauled by the contractor, at his own cost, from some one of the deposits of cement which shall be established by the United States on the bank of the canal, upon the written orders which he shall from time to time receive from the engineer for the same, and the engineer shall be the sole judge as to which deposit it shall be taken from, and shall express the same in said orders; the quantity drawn shall not in any case exceed three hundred pounds to each yard of stone laid, nor six hundred pounds to each one thousand of brick laid; any excess over this will be charged to said contractor at the rate of fifty cents per hundred pounds. Any unnecessary waste of cement or sand detected by the engineer will also be charged against the contractor—the cement at the same rate of fifty cents per one hundred pounds and the sand at its value; and this whether the prescribed quantity be used in the work or not. And of the proper care to be exercised by the contractor the engineer shall be the sole judge.

23. The contractor will be required to keep the cement dry and secure from the weather until used, and return the bags in which it was furnished in good order.

24. Clean sharp sand will be contracted for with other parties by the United States, and will be delivered upon the berme bank of the Chesapeake and Ohio canal, at some convenient point near the work, and will be transported to the work by the contractor at his own cost. And the contractor will be required to pass it through a fine screen before using.

25. Bricks have been contracted for with other parties, and will be furnished delivered upon the banks of the canal, or at some other point equally convenient, and will be transported to the work by the contractor for masonry.

26. *Centering.*—Centers will be furnished by the United States, delivered upon the berme bank of the Chesapeake and Ohio canal, to be transported to the work by the contractor, at his own cost, and will be set by the United States.

27. It is expressly stipulated that although the United States agree to furnish the materials above named, yet that if, from any cause, there should be delay or failure on the part of the said United States, there shall not be any claim for damages on the part of said contractors against the United States.

28. The United States will contract with other parties to do the necessary excavation for the foundation; but the preparation of the rock to receive the masonry, as directed in the specifications, by removing projections, cleaning, &c., will be done by the contractor for the masonry, such work being included in the cost of laying the masonry.

29. The contractor shall clear away from the whole breadth of the aqueduct any coarse material that he may have brought upon it during the construction of his work.

30. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons, objected to by the engineer, retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of these rules; any violation of them will be considered sufficient ground for the engineer to declare the contract void.

31. The contractor will be required to give his personal and constant attention to the work during its progress.

32. The materials and workmanship shall be of the best quality, shall be subject to the inspection of the engineer in charge, or such person as he may appoint, and drawings will be furnished by him of all the details of the work, and such directions given as may be necessary to insure its construction in accordance with the plan contemplated in these specifications.

33. Any work not satisfactory to the engineer will be taken down by the contractor and rebuilt at his own expense.

34. The masonry of the side walls of bridges will be laid in proper shape to receive the brick lining of the conduit, and plastered on the inside with cement mortar. This plastering will then be covered with a coat of thick boiled coal tar and dry cement. The outer ring of brick will then be laid in cement mortar up to grade. This will be lined by the United States with asphaltic mastic for greater security against leakage. The inner lining or ring of brick will then be laid by the contractor up to grade, the centers placed, and the inner ring of the upper arch or curve of the conduit laid and plastered with hydraulic cement; a coat of asphaltic mastic will then be applied to the extrados of the brick arch; the remainder of the arch will be turned and covered with thick boiled coal tar and cement, and the masonry laid over it.

Know all men by these presents that we, A. F. Offutt & Co., and E. M. Linthicum & Co., of Georgetown, District of Columbia, are held and firmly bound unto the United States of America in the full and just sum of three thousand dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well

and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this 12th day of June, anno Domini one thousand eight hundred and fifty-eight. The condition of the above obligation is such, that if H. L. Gallaher, his heirs, executors, or administrators, do and shall well and truly execute a contract which he, the said H. L. Gallaher, has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to excavate, construct, and build at his own proper cost, effluent gate-house and sluice gate-house of the receiving reservoir of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said H. L. Gallaher by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect; otherwise to remain in full force and virtue in law.

A. F. OFFUTT & CO. [SEAL.]
E. M. LINTHICUM & CO. [SEAL.]

Signed, sealed, and delivered in presence of—
EDWARD CAMMACK.

UNITED STATES COMMISSIONERS' OFFICE, *June* 12, 1858.

I certify that I am acquainted with A. F. Offutt & Co., and E. M. Linthicum & Co., of Georgetown, District of Columbia, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion sufficient sureties for the purposes mentioned in the within bond.

H. W. TILLEY, *P. M.*

WASHINGTON AQUEDUCT.

Contract for iron water gate and hoisting crab.

Agreement between Murray & Hazelhurst, of the State of Maryland, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting under the authority of and for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, *witnesseth:*

1. That the party of the first part, for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all materials which may be necessary and which may not be furnished by the United States, and to do all the work in constructing and building iron water gate and hoisting crab for effluent gate house of receiving reservoir of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part

of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate after the first shall be paid, unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed, and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained percentage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that purpose, and the contractor shall at all times, at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work, of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract that the work aforesaid shall be commenced within three days after the notification of the approval of this contract, that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within four months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed, that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the

engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then on a certificate of the fact, by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States, and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same, in any place, or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss, in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed, by the order of the engineer, from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer

which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be, in all its parts, subject to the terms and conditions of an act of Congress passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so constructed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereot, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular, the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this eighth day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

MURRAY & HAZLEHURST, [L. S.]
M. C. MEIGS, [L. S.]
Captain of Engineers,
Chief Engineer Washington Aqueduct.

(Done in quadruplicate.)

Witnesses:

C. SPENCER,
Z. W. DENHAM,
As to signature of Captain Meigs.

WASHINGTON AQUEDUCT.

Specification of iron water gate and hoisting crab for effluent gate house of receiving reservoir.

1. The method of construction and arrangement and size of parts are shown by the drawings.
2. The pedestals are to be lined with babbet metal.
3. All bolts, rivets, keys, cross-braces, shafts, 5 inch diameter and under, chains, handle, brake, and palls, to be wrought iron.
4. All other parts to be cast iron.
5. The bearings of the shafts are to be turned, the wheels and hubs bored, and the shafts fitted to them.
6. All the surfaces at connexions of parts of frame of gate to be turned, chipped, planed, or fitted, and all bolt holes reamed, and bolts turned and driven.
7. The whole to be completed in the best and most workmanlike manner, and of the best materials of the kind specified.
8. The masonry will have been constructed as shown on the drawings of effluent gate house by other contractors, and will have been prepared for setting up the gate.
9. The above is to set up complete by the 1st November, 1858, in the effluent gate house of receiving reservoir.

PROPOSAL.

10. The subscriber offers to furnish all the materials and perform all the labor in the construction and erection of water gate and hoisting crab for effluent gate house, ready for use, at the following price, to wit:
11. 10 cents per pound, finished weight.
12. The above price includes all materials, workmanship, labor, hauling, carts, horses, and scaffolding, and every expense necessary to the completion of the whole work, according to the specification and plan, and the contract I may hereafter sign, in the form, a copy of which has been shown to and read by me.
13. Signed by me, this 10th day of May, 1858.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

Know all men by these presents, that we, Cyrus Gault, of Baltimore, State of Maryland, are held and firmly bound unto the United States of America in the full and just sum of eighteen hundred dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this eighth day of June, anno Domini one thousand eight hundred and fifty-eight.

The condition of the above obligation is such, that if Murray & Hazlehurst, their heirs, executors, or administrators, do and shall well and truly execute a contract which they, the said Murray & Hazlehurst, have entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which they have contracted to excavate, construct, and build, at their own proper cost, iron water gate and hoisting crab for effluent gatehouse of receiving reservoir of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said Murray & Hazlehurst by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect; otherwise to remain in full force and virtue in law.

CYRUS GAULT, [L. S.]

Signed, sealed, and delivered in presence of—
C. SPENCER.

Six printed words erased and six written words substituted before signing.

UNITED STATES COMMISSIONER'S OFFICE,
June 9, 1858.

I certify that I am acquainted with Cyrus Gault, of Baltimore city, the surety named in the above bond, and that he is a freeholder and resident as aforesaid, and in my opinion sufficient surety for the purposes mentioned in the within bond.

JOHN HANAN,
U. S. Commissioner for Maryland.

WASHINGTON AQUEDUCT.

Contract for masonry of bridge No. 6, *and waste-weir between the two reservoirs.*

Agreement between Carman & Dobbins, of Philadelphia, of the State of Pennsylvania, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting under the authority of and for and in behalf of the United States of America, as engineer in charge of the Washington acqueduct, witnesseth:

1. That the party of the first part for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary and which may not be furnished by the United States, and to do all the work in constructing and building masonry of bridge No. 6 across Rock creek, on Pennsylvania avenue, and waste-weir between the two reservoirs, or so much as may be necessary to complete the same, of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate, shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the Treasury of the United States for coin. No estimate, after the first, shall be paid, unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained per centage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that purpose, and the contractor shall, at all times at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work, a report shall be made by the contractor to the assistant engineer having charge of this work, of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract that

the work aforesaid shall be commenced within three days after the notification of the approval of this contract; that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within six months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then, on a certificate of the fact, by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States, and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss, in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not, knowingly, employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed by the order of the engineer from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who

shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement, with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down, at his own expense, and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be, in all its parts, subject to the terms and conditions of an act of Congress passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sub-let nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular, the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this 30th day

of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

M. S. CARMAN, [L. S.]
RICHARD J. DOBBINS, [L. S.]
M. C. MEIGS, [L. S.]
Captain of Engineers, Chief Engineer Washington Aqueduct.

(Done in quadruplicate.)

Witnesses:

H D. WILSON, witness at the signing of Richard J. Dobbins and M. S. Carman.

Z. W. DENHAM, as to signature of Captain Meigs.

WASHINGTON AQUEDUCT.

Specification for waste-weir between the two reservoirs.

1. The structure is explained by the drawings.

2. It will consist of a masonry structure, with proper grooves for stop planks, and two sluices governed by cast-iron paddles, like those of the Chesapeake and Ohio canal locks, affording the means of regulating the height of the water in the conduit.

3. The sluices in which the gates are placed will be built of cut stone, and the coping of the wall over the gates will be hammer dressed. The remainder of the work will be faced with rock-face ashlar of Seneca grey sandstone, and backed with good rubble, all laid in cement mortar.

4. For style and mode of constructing the masonry reference is made to the general specifications of masonry for the Washington aqueduct, herewith.

5. The coping will be securely doweled, and copper gutters 1½ inch wide will be placed under its joints.

6. Dowels, clamps, and copper will be furnished by the United States, and the price of masonry will include all drilling or cutting, and the insertion of the parts of metal.

7. Gates, the valve gates of cast iron will be set in frames of white oak.

PROPOSAL.

[N. B.—No bid will be considered unless all the blanks for prices are filled.]

8. I offer to furnish all the materials not furnished by the United States, to cut the stone, build the masonry, and do all the work necessary for the construction of the waste-weir described in these specifications, and clear away, after the work is finished, all the rubbish, stone, and coarse material that may have accumulated about the site of the work, in conformity to the above specifications, and the directions I may from time to time receive from the engineer, for the following prices, to wit:

9. For rock-faced masonry, per cubic yard $7 40
10. For cut masonry and coping, per cubic yard 12 50
11. For valve gates and rods, handles, frames, and fixtures, all complete and set, including fitting to the masonry and every expense, each set 75 00
12. For furnishing Seneca gray sandstone for face work, per cubic foot..... 30

13. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, machinery, and tools not furnished by the United States, and every expense necessary to the completion of the whole work, according to the specifications and plans, and the contract which I may hereafter sign, in the form, a copy of which has been shown to and read by me.

14. Signed by me, this 11th day of May, 1858.

RICHARD I. DOBBINS,
M. S. CARMAN.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of in the State of hereby, jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specifications for the masonry of bridge No. 6 across Rock creek, on Pennsylvania avenue.

GENERAL DESCRIPTION.

1. Bridge to consist of a cast-iron arch, formed by cylinders of 48 inches interior diameter, with flanged joints bolted together; the spandrels are of wrought iron, and the floor of wood.

2. The clear span between the faces of the abutments below the skewback is 198 feet 7¾ inches. At the springing line of the intrados it is 200 feet, and at the bridge seat 204 feet 5 inches. For other dimensions see drawings.

3. The abutments will rest upon stepped foundations, which will probably require no other preparation than the excavation to the lines

shown upon the plan; but if additional precaution be thought necessary by the engineer in charge, whatever is so required shall be paid for separately.

4. *Masonry.*—The masonry of the abutments to be composed of best quality gray Seneca sandstone, Quincy granite, hard blue gneiss, hard, well burned brick, and good hydraulic mortar.

5. The exterior walls and fronts to be ranged rock work of Seneca gray sandstone, in continuous horizontal courses, decreasing as they rise, but nowhere less than 15 inches in thickness, and with hammer-dressed beds and joints, the headers running through the wall. The stone on its outer face to have a draught of 1½ inch all round; no projection more than 3 inches from the face will be allowed. In other respects to conform to the general specifications answering this character of work.

6. The centre wall of the abutments to be of the best rubble, executed according to the general specifications for masonry, with the joints and beds of rough work laid in full beds of mortar.

7. The seats or skewbacks for the cast-iron ribs shall be of sound Quincy granite, cut to the dimensions to be given by the engineer. These stones will be of large size, not exceeding, however, 10 feet long, 6 feet wide, and 2½ feet deep.

8. The parapets, coping, water table, arch stones for doorways, ornamental buttresses, to be cut in the best style.

9. This work is to be laid to a joint not more than $\frac{3}{16}$ inch.

10. The relieving arches within the abutments to be of brick.

11. The iron pipes which pass through the abutment will be laid by the contractor for the iron work of the bridge; but the contractor for the masonry shall afford him all reasonable facilities for so doing, and shall not found any claim upon the United States for delay on the part of the contractor for the iron work.

12. The skewbacks of the arches are not to be laid until the iron work is ready for adjustment to its bearing upon them.

13. The filling over the relieving arches in the abutment will be of concrete made of hydraulic mortar and gravel, instead of broken stone. This filling will be arranged to drain to the centre, and the waste water will be led through the face of the abutment by a cast-iron pipe four inches in diameter, to be furnished by the United States.

14. The concrete roof will be covered with a water-tight coating of thick boiled coal tar and hydraulic cement, upon which, after proper arrangements for drainage are made, shall be placed a layer of good, clean gravel, eighteen inches in thickness.

15. Strong wrought-iron ties will be inserted in the walls, connecting them together, as may be directed during the construction.

16. The price for masonry will cover all expenses of fitting the masonry for the iron work, and of setting the ties and clamps to be used in the work.

17. The work is explained by drawings, and full drawings of details will be furnished by the engineer during the construction of the work, and will be strictly followed by the contractor.

18. For specifications as to materials and workmanship, reference is made to the general specifications for masonry of the Washington

aqueduct herewith, which are to apply in all cases coming under these specifications, except where otherwise herein provided.

19. The work having been commenced, materials which should be delivered by the contractor, but which may be already provided for the work and not used in it, will be charged to the contractor at cost.

PROPOSAL.

[N. B.—No bid will be considered unless all the blanks for prices are filled.]

20. I offer to furnish all the materials not furnished by the United States, to cut the stone, and do all the work and transportation necessary to complete the work described in the specifications herewith, in conformity to the drawings and specifications, and to the directions I may receive from time to time from the engineer or his deputy, for the following prices, to wit:

21. For cutting stone for rock-face ashlar facing, per superficial foot of surface cut	$0 17
22. For cutting fine cut work of skewbacks, parapets, buttresses, water table mouldings, and other ornamental work, per superficial foot of surface fine cut	33
23. For furnishing Seneca gray sandstone for exterior face, per cubic foot	25
24. For granite skewbacks furnished, finished, and set, per cubic foot	1 25
25. For furnishing rubble stone for backing, per cubic yard	1 50
26. For laying stone masonry, including transportation of materials, per cubic yard	3 00
27. For laying bricks in arch, per thousand	5 00

28. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, machinery, and tools not furnished by the United States, and every expense necessary to the completion of the whole work, according to the specifications and plans, and the contract which I may hereafter sign, in the form, a copy of which has been shown to and read by me.

29. Signed by me this eleventh day of May, 1858.

M. S. CARMAN.
RICHARD J. DOBBINS.

To Captain M. C. Meigs, United States Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification of Masonry.—General Description.

1. The various works of masonry are explained by drawings; and in the course of the work full working drawings of details will be furnished by the engineers.

2. The drawings will be strictly followed by the contractor.

3. The stone for dressed face work, for ashlar, for ring stones of arches, and generally for cut and finished work, will be of gray sandstone from the government quarry at Seneca. The quarry is worked for the United States by H. L. Gallaher, and the stone is supplied at the following prices:

4. For quarrying ashlar, ring stones, steps, and other dimension stone, to be cut, per cubic foot..... $0 18

5. For rubble for backing, per perch..... 0 75

6. For cutting ring stones, steps, and coping, per superficial foot of surface cut..... 0 25

7. For cutting ashlar, rock face, per superficial foot of beds and joints..... 0 18

8. Stone delivered at the quarry on boats furnished by the contractor for masonry.

9. Stone will be delivered to the contractor, and charged to him at the above rates; or he may quarry sandstone of the same color and quality elsewhere, and cut them himself. It is also left optional with him whether to receive the stone in the rough at the first-named rate, and cut them himself, or to receive them ready cut at the rates specified.

10. Rubble stone for backing will be of hard blue stone or gneiss from the quarries near the line of the aqueduct and canal.

11. *Masonry*--to be built of sound, well-shaped, and durable stone, or hard, well-burned brick, laid in full beds of mortar, composed of clean, sharp sand and hydraulic cement.

12. The joints of mortar should not be more than three-eights inch in thickness in brick work, and half an inch in stone. Iron clamps will be furnished by the United States, but the contractor will be required to build them into the masonry. The stones will be set carefully and accurately. The whole of the masonry will be laid in flush mortar and grouted, so as to insure every joint to be filled solid with cement mortar or grout.

13. Spandrels, abutments, and foundation walls will be of the best quality of rock face masonry, built with stones not less than six inches thick, nor less than eighteen inches bed; every stone less than two feet in thickness to have at least one-half more bed than rise; over that thickness it is sufficient that its bed and rise are the same. The bond shall in no case be less than eighteen inches; there shall be at least one header in every eight feet of a course, and no stone shall be considered as a header that is less than four feet in length. In spandrels and backing the stones in contact with the arch will be laid for the depth designated in the drawings, with their beds conforming to the radius lines of the arch.

14. Where masonry or concrete is laid upon or against rock, the rock must be first freed from all earthy matter, by scraping and washing, and all irregularities and projections removed, so as to bring it to a uniform surface; it will also be kept wet at the time of laying the masonry, and all holes and depressions will be filled with concrete or with spalls, forced into full beds of mortar, and the stones forming the first course will be selected of the largest size. The stone used in masonry should be kept wet. and free from any dirt that would prevent the adherence of the cement.

15. No foundation shall be built upon until it shall have been seen and approved of by the engineer in charge.

16. The coping of bridges will be built into the abutment and spandrel walls, having a wash on top, and a drip channel underneath, two inches from the outer edge, as shown on the plan; the stone will be rough hammer-dressed with joints of three-eighths inch, not less than three feet wide, and will be secured with iron dowels and clamps, and copper gutters under the joints, as shall be directed by the engineer; the dowels and clamps and copper will be furnished by the United States. The price paid for coping will include any drilling or other preparation that may be necessary for their application.

17. The United States reserve the right to furnish the stone for the work, in whole or in part, to be delivered upon the berme bank of the Chesapeake and Ohio canal, adjacent to the work.

18. Concrete shall consist of broken stone, or brick, and cement mortar, in the proportions of one barrel of cement and two of sand to 30 cubic feet of broken stone or brick; the stone to be measured with care and well mixed with cement in the above proportions, on a platform of plank, convenient to the work, from which it may be shoveled or carried on a wheelbarrow to the place where it is to be used; and after being deposited and spread in layers one foot thick, it shall be rammed with wooden rammers until it is brought into a compact state.

19. The stone or brick for concrete shall be broken into fragments not exceeding half a pound in weight; but, whenever concrete is used in large masses, stones containing from two to twenty cubic feet may be deposited in it, care being taken that such stones rest on a good bed and are far enough apart to allow the rammers to pass between them, and insure the complete contact of the concrete with them.

20. When concrete is placed in contact with rock, the rock must be first scraped and washed.

21. The mortar used for masonry shall consist of one part of cement to two parts of clean sharp sand, to be first mixed dry, and afterwards water to be added as wanted, in small quantities; it shall be mixed upon an approved bed, formed of plank, under shelter from the sun and rain, and the time between the first wetting of the cement and its being used in the work shall never exceed one half-hour.

22. The cement will be furnished by the United States, and will be hauled by the contractor, at his own cost, from some one of the deposits of cement which shall be established by the United States on the bank of the canal, upon the written orders which he shall, from time to time, receive from the engineer for the same, and the engineer

shall be the sole judge as to which deposit it shall be taken from, and shall express the same in said orders; the quantity drawn shall not, in any case, exceed 300 pounds to each yard of stone laid, nor 600 pounds to each 1,000 of brick laid. Any excess over this will be charged to said contractor, at the rate of fifty cents per 100 pounds. Any unnecessary waste of cement or sand, detected by the engineer, will also be charged against the contractor—the cement at the same rate of 50 cents per 100 pounds, and the sand at its value; and this whether the prescribed quantity be used in the work or not; and of the proper care to be exercised by the contractor the engineer shall be the sole judge.

23. The contractor will be required to keep the cement dry and secure from the weather until used, and return the bags in which it was furnished in good order.

24. Clean sharp sand will be contracted for with other parties be the United States, and will be delivered upon the berme bank of tyh Chesapeake and Ohio canal, at some convenient point near the work, and will be transported to the work by the contractor, at his own cost. And the contractor will be required to pass it through a fine screen before using.

25. Bricks have been contracted for with other parties, and will be furnished delivered upon the banks of the canal, or at some other point equally convenient, and will be transported to the work by the contractor for masonry.

26. *Centering.*—Centres will be furnished by the United States, delivered upon the berme bank of the Chesapeake and Ohio canal, to be transported to the work by the contractor at his own cost, and will be set by the United States.

27. It is expressly stipulated that although the United States agree to furnish the materials above named, yet that if, from any cause, there should be delay or failure on the part of the said United States, there shall not be any claim for damages on the part of said contractors against the United States.

28. The United States will contract with other parties to do the necessary excavation for the foundation; but the preparation of the rock to receive the masonry, as directed in the specifications, by removing projections, cleaning, &c., will be done by the contractor for the masonry, such work being included in the cost of laying the masonry.

29. The contractor shall clear away from the whole breadth of the aqueduct any coarse material that he may have brought upon it during the construction of his work.

30. No ardent spirits shall be used or allowed on any part of the work, and no disorderly person or persons, objected to by the engineer, retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of these rules; any violation of them will be considered sufficient ground for the engineer to declare the contract void.

31. The contractor will be required to give his personal and constant attention to the work during its progress.

32. The materials and workmanship shall be of the best quality, shall be subject to the inspection of the engineer in charge, or such person as he may appoint, and drawings will be furnished by him of all the details of the work, and such directions given as may be necessary to insure its construction in accordance with the plan contemplated in these specifications.

33. Any work not satisfactory to the engineer will be taken down by the contractor and rebuilt at his own expense.

34. The masonry of the side walls of bridges will be laid in proper shape to receive the brick lining of the conduit, and plastered on the inside with cement mortar. This plastering will then be covered with a coat of thick boiled coal tar and dry cement. The outer ring of brick will then be laid in cement mortar up to grade. This will be lined by the United States with asphaltic mastic for greater security against leakage. The inner lining or ring of brick will then be laid by the contractor up to grade, the centres placed, and the inner ring of the upper arch or curve of the conduit laid and plastered with hydraulic cement; a coat of asphaltic mastic will then be applied to the extrados of the brick arch; the remainder of the arch will be turned and covered with thick boiled coal tar and cement, and the masonry laid over it.

Know all men by these presents, that we, Frederick H. Wehr, of Baltimore, State of Maryland, and Robert McCay, jr., of Philadelphia, State of Pennsylvania, are held and firmly bound unto the United States of America in the full and just sum of twelve thousand dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this thirtieth day of June, anno Domini one thousand eight hundred and fifty-eight. The condition of the above obligation is such, that if Carman & Dobbins, their heirs, executors, or administrators, do and shall well and truly execute a contract which they, the said Carman & Dobbins, have entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which they have contracted to excavate, construct, and build at their own proper cost, masonry of bridge No. 6, across Rock creek, on Pennsylvania avenue, and waste-weir, between the two reservoirs of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said Carman & Dobbins by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect; otherwise to remain in full force and virtue in law.

FREDK. WEHR, [SEAL.]
R. McCAY, JR., [SEAL.]

Signed, sealed, and delivered in presence of—
H. D. WILSON.

Six printed words erased and six written words substituted before signing.

UNITED STATES COMMISSIONER'S OFFICE, —— 185 .

I certify that I am acquainted with ——— and ——— of ———, the sureties in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion sufficient sureties for the purposes mentioned in the within bond.

WASHINGTON AQUEDUCT.

Contract for masonry of Bridge No. 5, over College branch.

Agreement between James Roach, of the State of Virginia, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting under the authority of, and for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

1. That the party of the first part for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary, and which may not be furnished by the United States, and to do all the work in constructing and building masonry of bridge No. 5, over College branch, or so much as may be necessary to complete the same, of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate, shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate, after the first, shall be paid, unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained percentage.

6. The work shall always be open to examination during its progress by the engineers, or other persons they may depute for that purpose, and the contractor shall at all times, at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work, of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract, that the work aforesaid shall be commenced within three days after the notification of the approval of this contract; that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within five months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed, that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto, by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer may be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then, on a certificate of the fact by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved percentage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States, and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same in any place or under any circumstances whatever; but the party of the

first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed by the order of the engineer from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild the work so disapproved of the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer, which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord

one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14th, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above-recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular, the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this seventh day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

J. ROACH, [SEAL.]
M. C. MEIGS, [SEAL.]
Captain of Engineers,
Chief Engineer Washington Aqueduct.

[Done in quadruplicate.]
Witnesses—

T. S. EVERETT,

JNO. EDW. GOURLAND.
Z. W. DENHAM, as to signature of Capt. Meigs.

WASHINGTON AQUEDUCT.

Specification for masonry of bridge No. 5, over College branch.

1. The *bridge* will be made of cast iron pipes, with cross bracing of cast and wrought iron, abutments of masonry, and wooden casing, all of which is explained by the drawings.

ABUTMENTS.

2. *Foundations* will be sunk if possible to the rock, and consist of a mass of concrete rising to within six (6) inches of the surface of the water in the canal.

3. *Masonry* will be of large well-shaped stones, hammer-dressed; the skewback will be cut smooth, and the stones will conform to the drawings. The lateral faces, rock ashlar, with a neat draft one and

a half (1½) inch wide around each joint, over which the rock must not project more than two inches. The top course to be clamped with cast-iron dowels, which will be furnished by the United States—all laid in cement mortar. The voids to be lined with brick.

4. The iron pipes which pass through the abutments will be laid by the contractor for the iron work of the bridge; but the contractor for the masonry shall afford him all reasonable facilities for so doing, and shall not found any claim upon the United States for delay on the part of the contractor for the iron work.

5 For other details, see general specifications for masonry.

6. The work has been commenced, and the contract will be limited to completing the masonry.

7. All materials and work which it may be the business of the contractor to furnish, but which may have been provided for the work at the time it is assumed by him, will be charged to him at cost.

PROPOSAL.

[N. B. No proposal will be considered unless all the blanks for prices are filled.]

8. The subscriber offers to furnish all the materials not furnished by the United States, and to do all the work necessary to complete the abutments at bridge No. 5 over College branch, on the Washington aqueduct, described in the specifications herewith, and to clear away all rubbish or coarse materials that may have accumulated about the site in conformity to the specifications herewith, to the plans and to the directions he may from time to time receive from the engineer, for the following prices, to wit:

9. For concrete, per cubic yard laid..... $3 00
10. For masonry, per cubic yard laid..... 5 37½
11. For bricks, per thousand laid..... 5 00

12. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, machinery, and tools not furnished by the United States, and every expense necessary to the completion of the whole work according to the specifications and plans, and the contract which I may hereafter sign, in the form a copy of which has been shown to and read by me.

13. Signed by me, this eleventh day of May, 1858.

J. ROACH.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of , in the State of , hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said shall fail to enter into contract as aforesaid,

we guaranty to make good the difference between the offer by the said , and the next lowest bidders.

I hereby certify that to the best of my knowledge and belief the above named guarantors are good and sufficient.

WASHINGTON AQUEDUCT.

Specification of Masonry.—General description.

1. The various works of masonry are explained by drawings, and in the course of the work full working drawings of details will be furnished by the engineers.

2. The drawings will be strictly followed by the contractor.

3. The stone for dressed face work, for ashlar, for ring stones of arches, and generally for cut and finished work, will be of gray sandstone from the government quarry at Seneca. This quarry is worked for the United States by H. L. Gallaher, and the stone is supplied at the following prices:

4. For quarrying ashlar, ring stones, steps, and other dimension stone, to be cut, per cubic foot..... $0 18
5. For rubble for packing, per perch..... 75
6. For cutting ring stones, steps, and coping, per superficial foot of surface cut..... 25
7. For cutting ashlar, rock face, per superficial foot of beds and joints..... 18

8. Stone delivered at the quarry on boats furnished by the contractor for masonry.

9. Stone will be delivered to the contractor, and charged to him at the above rates; or he may quarry sandstone of the same color and quality elsewhere, and cut them himself. It is also left optional with him whether to receive the stone in the rough at the first-named rate, and cut them himself, or to receive them ready cut at the rates specified.

10. Rubble stone for packing will be of hard blue stone or gneiss from the quarries near the line of the aqueduct and canal.

11. *Masonry*—to be built of sound, well-shaped, and durable stone, or hard, well-burned brick, laid in full beds of mortar, composed of clean, sharp sand and hydraulic cement.

12. The joints of mortar should not be more than three-eighths of an inch in thickness in brick work, and half an inch in stone. Iron clamps will be furnished by the United States, but the contractor will be required to build them into the masonry. The stones will be set carefully and accurately. The whole of the masonry will be laid in flush mortar and grouted, so as to insure every joint to be filled solid with cement mortar on grout.

13. Spandrels, abutments, and foundation walls will be of the best quality of rock face masonry, built with stones not less than six inches

thick, nor less than eighteen inches bed; every stone less than two feet in thickness to have at least one-half more bed than rise; over that thickness it is sufficient that its bed and rise are the same. The bond shall in no case be less than eighteen inches; there shall be at least one header in every eight feet of a course, and no stone shall be considered as a header that is less than four feet in length. In spandrels and backing the stones in contact with the arch will be laid for the depth designated in the drawings, with their beds conforming to the radius lines of the arch.

14. Where masonry or concrete is laid upon or against rock, the rock must be first freed from all earthy matter, by scraping and washing, and all irregularities and projections removed, so as to bring it to a uniform surface; it will also be kept wet at the time of laying the masonry, and all holes and depressions will be filled with concrete or with spalls, forced into full beds of mortar, and the stones forming the first course will be selected of the largest size. The stone used in masonry should be kept wet, and free from any dirt that would prevent the adherence of the cement.

15. No foundation shall be built upon until it shall have been seen and approved of by the engineer in charge.

16. The coping of bridges will be built into the abutment and spandrel walls, having a wash on top, and a drip channel underneath two inches from the outer edge, as shown on the plan; the stone will be rough hammer-dressed with joints of three-eighths of an inch, not less than three feet wide, and will be secured with iron dowels and clamps, and copper gutters under the joints, as shall be directed by the engineer; the dowels and clamps and copper will be furnished by the United States. The price paid for coping will include any drilling or other preparation that may be necessary for their application.

17. The United States reserve the right to furnish the stone for the work, in whole or in part, to be delivered upon the berm bank of the Chesapeake and Ohio canal, adjacent to the work.

18. Concrete shall consist of broken stone or brick and cement mortar, in the proportions of one barrel of cement and two of sand to thirty cubic feet of broken stone or brick; the stone to be measured with care and well mixed with cement in the above proportions, on a platform of plank convenient to the work, from which it may be shoveled or carried on a wheelbarrow to the place where it is to be used; and after being deposited and spread in layers one foot thick, it shall be rammed with wooden rammers until it is brought into a compact state.

19. The stone or brick for concrete shall be broken into fragments not exceeding half a pound in weight; but whenever concrete is used in large masses, stones containing from two to twenty cubic feet may be deposited in it, care being taken that such stones rest on a good bed and are far enough apart to allow the rammers to pass between them, and insure the complete contact of the concrete with them.

20. When concrete is placed in contact with rock, the rock must be first scraped and washed.

21. The mortar used for masonry shall consist of one part of cement to two parts of clean sharp sand, to be first mixed dry and afterwards

water to be added as wanted, in small quantities; it shall be mixed upon an approved bed, formed of plank, under shelter from the sun and rain, and the time between the first wetting of the cement and its being used in the work shall never exceed one half-hour.

22. The cement will be furnished by the United States, and will be hauled by the contractor, at his own cost, from some one of the deposits of cement which shall be established by the United States on the bank of the canal, upon the written orders which he shall from time to time receive from the engineer for the same, and the engineer shall be the sole judge as to which deposit it shall be taken from, and shall express the same in said orders; the quantity drawn shall not in any case exceed 300 pounds to each yard of stone laid, nor 600 pounds to each 1,000 of brick laid. Any excess over this will be charged to said contractor, at the rate of 50 cents per 100 pounds. Any unnecessary waste of cement or sand, detected by the engineer will also be charged against the contractor, the cement at the rate of 50 cents per 100 pounds, and the sand at its value; and this whether the prescribed quantity be used in the work or not; and of the proper care to be exercised by the contractor the engineer shall be the sole judge.

23. The contractor will be required to keep the cement dry and secure from the weather until used, and return the bags in which it was furnished in good order.

24. Clean sharp sand will be contracted for with other parties by the United States, and will be delivered upon the berm bank of the Chesapeake and Ohio canal, at some convenient point near the work, and will be transported to the work by the contractor, at his own cost. And the contractor will be required to pass it through a fine screen before using.

25. Bricks have been contracted for with other parties, and will be furnished delivered upon the banks of the canal, or at some other point equally convenient, and will be transported to the work by the contractor for masonry.

26. *Centering.*—Centres will be furnished by the United States, delivered upon the berm bank of the Chesapeake and Ohio canal, to be transported to the work by the contractor, at his own coast, and will be set by the United States.

27. It is expressly stipulated that although the United States agree to furnish the materials above named, yet that if, from any cause, there should be delay or failure on the part of the United States, there shall not be any claim for damages on the part of said contractors against the United States.

28. The United States will contract with other parties to do the necessary excavation for the foundation; but the preparation of the rock to receive the masonry, as directed in the specifications, by removing projections, cleaning, &c., will be done by the contractor for the masonry, such work being included in the cost of laying the masonry.

29. The contractor shall clear away from the whole breadth of the aqueduct any coarse material that he may have brought upon it during the construction of his work.

30. No ardent spirit shall be used or allowed on any part of the

work, and no disorderly person or persons, objected to by the engineer, retained in the employment of the contractor. Permitting men to board where ardent spirits are used or sold, though the premises should not be under the control of the contractor, will be considered a violation of these rules; any violation of them will be considered sufficient ground for the engineer to declare the contract void.

31. The contractor will be required to give his personal and constant attention to the work during its progress.

32. The materials and workmanship shall be of the best quality, shall be subject to the inspection of the engineer in charge, or such person as he may appoint, and drawings will be furnished by him of all the details of the work, and such directions given as may be necessary to insure its construction in accordance with the plan contemplated in these specifications.

33. Any work not satisfactory to the engineer will be taken down by the contractor and rebuilt at his own expense.

34. The masonry of the side walls of bridges will be laid in proper shape to receive the brick lining of the conduit, and plastered on the inside with cement mortar. This plastering will then be covered with a coat of thick boiled coal tar and dry cement. The outer ring of brick will then be laid in cement mortar up to grade. This will be lined by the United States with asphaltic mastic for greater security against leakage. The inner lining or ring of brick will then be laid by the contractor up to grade, the centres placed, and the inner ring of the upper arch or curve of the conduit laid and plastered with hydraulic cement; a coat of asphaltic mastic will then be applied to the extrados of the brick arch; the remainder of the arch will be turned and covered with thick boiled coal tar and cement, and the masonry laid over it.

Know all men by these presents, that we, James Roach, of Alexandria county, in the State of Virginia, and John J. Bogue, of Georgetown, in the District of Columbia, are held and firmly bound unto the United States of America in the full and just sum of five hundred dollars lawful money of the United States, to be paid to the said United States or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this 7th day of June, anno Domini, one thousand eight hundred and fifty-eight: The condition of the above obligation is such, that if James Roach, his heirs, executors, or administrators, do and shall well and truly execute a contract which he the said James Roach has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to excavate, construct, and build at his own proper cost, masonry of bridge No. 5, of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said James Roach by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the fore-

going obligation to be void and of no effect, otherwise to remain in full force and virtue in law.

J. ROACH, [SEAL.]
JOHN J. BOGUE. [SEAL.]

Signed, sealed, and delivered in presence of—
JAMES A. DONNELLY,
GEORGE W. EASTON.

UNITED STATES POST OFFICE,
June 7, 1858.

I certify that I am acquainted with James Roach, of Alexandria county, and John J. Bogue, of Georgetown, District of Columbia, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion sufficient sureties for the purposes mentioned in the within bond.

H. W. TILLEY,
Postmaster.

WASHINGTON AQUEDUCT.

Contract for iron and wood work of bridge No. 5.

Agreement between John Hutchinson, of the city of Troy, of the State of New York, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting under the authority of, and for and in behalf of the United States of America, as Engineer in charge of the Washington aqueduct, witnesseth:

1. That the party of the first part, for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary and which may not be furnished by the United States, and to do all the work in constructing and building iron and wood work of bridge No. 5, over College branch, or so much as may be necessary to complete the same, of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from

the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the Treasury of the United States for coin. No estimate after the first shall be paid, unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed, and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained per centage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that purpose, and the contractor shall, at all times, at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work, of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract that the work aforesaid shall be commenced within three days after the notification of the approval of this contract, that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within six months thereafter unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed that, in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then on a certificate of the fact by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all materials furnished and

work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States; and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same, in any place, or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties that, in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed, by the order of the engineer, from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer which shall cause an increase or diminution in the quantity or value of the work to be performed shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under

this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, Nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sublet nor assigned, but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this seventh day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

JOHN HUTCHINSON. [SEAL.]

M. C. MEIGS, [SEAL]
Captain of Engineers, Chief Engineer Washington Aqueduct.

(Done in quadruplicate.)

Witness as to John Hutchinson—
MILES BRACK.

Witness as to signature of Captain Meigs—
WM. G. MOORE.

WASHINGTON AQUEDUCT.

Specification for iron and wood work of bridge No. 5, over College branch.

1. The *bridge* will be made of cast-iron pipes, with cross bracings of cast and wrought iron and wooden casing, all of which is explained by the drawings.

2. The *pipes* for the bridge arch will be thirty (30) inches inside

diameter, and one (1) inch thick; the flanges to be one and a quarter ($1\frac{1}{4}$) inch thick, and three (3) inches broad, cast with the proper bevel, and turned off perfectly true and fair; and, in one word, all the parts fitted true and fair, to the satisfaction of the engineer. The pipes must pass the usual inspection, and the proof of three hundred (300) pounds per square inch.

3. *Wrought iron* to be of the best American iron, fibrous and tough; bolts over three (3) feet long, to be forged thicker at the ends to allow for the thread.

4. The *air cocks* to be approved by the engineer.

5. *Stopcocks* to be furnished by the United States.

6. The *wooden casing* of the aqueduct to be, as per drawing, of sound Georgia yellow pine joists, and white pine plank, painted with three coats of good oil paint, of such color as may be directed, and sanded. The mouldings to be neatly made and well secured.

7. The *centre* to be at the expense of the contractor, and approved by the engineer.

8. *Raising.*—The pipes to be laid on the centre, and the bolts and cross bracing put in place. When the bolts are tightened, the foot casting will be secured by caulking in cement, or by grouting, as may be directed. The tightening of the iron work, and the removal of the centres to be done under the supervision and direction of the engineer.

9. The test of the bridge, which shall be instituted with the centres still standing, but eased, shall be a weight of 1,000 pounds per lineal foot, placed as the engineer may direct; and any leakage, failure, loss, or damage under this load, shall be made good by the contractor at his own expense.

10. As the work of this bridge has already been commenced, the work to be contracted for will be limited to the materials and work not yet under contract.

11. The cast iron arch pipes and braces are already under contract to the contractors for iron pipes.

12. The centre, the erection of the iron work, the furnishing and erection of the wrought iron braces, the wooden casing, and whatever may not be done at the time the contract is declared, will enter into the contract.

13. All materials and work which it may be the business of the contractor to furnish, and which may be provided for the work when resigned to him, will be charged to him at cost.

PROPOSAL.

[N. B. No proposal will be considered unless all the blanks for prices are filled.]

14. The subscriber offers to furnish all the materials not furnished by the United States, and to do all the work necessary to complete the iron and wood work of the pipe bridge No. 5, over College branch, on the Washington aqueduct, as described in the preceding specifications, to clear away from the site after the work is finished, all rubbish and coarse material, in conformity to the plans to the preceding

specifications, and the directions he may receive from time to time from the engineer, for the following prices, to wit:

15.	For cast iron, per ton of 2,240 pounds*	$67 20
16.	For wrought iron, per ton of 2,240 pounds	295 00
17.	For each 2-inch air cock, in place	80 00
18.	For timber and plank, in casing, per thousand feet board measure, including painting, sanding, and placing	65 00

19. All work not specified to be paid for according to the estimate of the engineer.

20. The above prices include all materials, workmanship, labor, hauling, carts, horses, scaffolding, machinery, and tools not furnished by the United States, and every expense necessary to the completion of the whole work according to the specifiations and plans, and the contract which I may hereafter sign, in the form a copy of which has been shown to and read by me.

21. Signed by me this fifth day of May, 1858.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of ———, State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

Know all men by these presents, that we, Alexander H. Crary and Simeon T. Seamen, of Troy, in the county of Rensselaer, State of New York, are held and firmly bound unto the United States of America in the full and just sum of sixteen hundred dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole, and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this seventh day of June, anno Domini, one thousand eight hundred and fifty-eight: The condition of the above obligation is such, that if John Hutchinson, his heirs, executors, or administrators, do and shall

* The bid, as above, for cast iron per ton, is only for the labor of construction of this bridge according to the specification and plan exhibited, being informed that the government has already contracted for the cast iron for the same, and is to furnish it to the contractor.

well and truly execute a contract which he the said John Hutchinson has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to excavate, construct, and build at his own proper cost, iron and wood work of bridge No. 5, over College branch of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said John Hutchinson by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect, otherwise to remain in full force and virtue in law.

ALEXANDER H. CRARY. [SEAL.]
SIMEON T. SEAMAN. [SEAL.]

Signed, sealed, and delivered in presence of—
J. LEONARD BARNEY.

UNITED STATES COMMISSIONER'S OFFICE,
Troy, June 7, 1858.

I certify that I am acquainted with Alexander H. Crary and Simeon T. Seaman, of the city of Troy, in the county of Rensselaer, and State of New York, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion sufficient sureties for the purposes mentioned in the within bond.

W. A. BEACH,
United States Commissioner for Northern Dist. of New York.

WASHINGTON AQUEDUCT.

Contract for iron and timber work of bridge, No. 6, *across Rock Creek.*

Agreement between A. & W. Denmead & Sons, of Baltimore, of the State of Maryland, of the first part, and Captain M. C. Meigs, of the corps of United States Engineers, of the second part, acting under the authority of and for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

1. That the party of the first part, for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary and which may not be furnished by the United States, and to do all the work in constructing and building iron and timber work of bridge, No. 6, across Rock creek, or so much as may be necessary to complete the same, of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction shall, as soon as practicable after the end of each month

make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate, shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate after the first shall be paid unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed

5. Within thirty days after the work shall have been completed and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained per centage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that purpose; and the contractor shall, at all times, at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work, of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed, between the parties to this contract, that the work aforesaid shall be commenced within three days after the notification of the approval of this contract, that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within five months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed, that, in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the

contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then, on a certificate of the fact by the principal assistant engineer made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States; and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesad, and he hereby releases all right to except to or question the same, in any place, or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that, in order to secure the punctual performance of the covenants above made by the party of the first part and to indemnify and protect the party of the second part from loss in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed by the order of the engineer from any other part of the work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands, and, as far as practicable, by any other persons.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer, which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for

work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided,* nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also,* That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties, this twenty-fourth day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

A. & W. DENMEAD & SONS, [L. S.]
M. C. MEIGS, [L. S.]
Captain of Engineers, Chief Engineer Washington Aqueduct.

[Done in quadruplicate.]

Witnesses: JOHN MCELROY,
BENJAMIN F. DENMEAD.

Witness as to signature of Captain Meigs—
WILLIAM G. MOORE.

WASHINGTON AQUEDUCT.

Specifications for the iron and timber work of bridge No. 6, across Rock creek.

GENERAL DESCRIPTION.

1. Bridge to consist of a cast iron arch, formed of two ribs of forty-eight inch circular pipes, lined with three-inch staves of resinous pine, ribs to be eighteen feet from centre to centre, transversely, with bolts and braces and flanges, as shown in the drawings. These pipes are to convey the water of the aqueduct.

2. The span of the intrados of the arch will be two hundred feet, and the rise twenty feet. The ribs are to bear upon a foot plate, with a conical base, to the under side of which the pipe connecting the arch with the interior of the abutment will be secured; dry cement will then be rammed into the joint, between the cast iron plate and the masonry, before striking the centre, and the arch thus adjusted to its bearing.

3. The construction and arrangement of the iron work are shown in the drawings, and during the construction of the bridge full drawings and explanations of details will be placed in the hands of the contractor, who must adhere closely to them. The pipes are to resist a hydraulic proof strain of 300 pounds per square inch.

4. The spandrels are to be, for the most part, composed of wrought-iron H beams, 9 inches deep, of the same shape and quality as those manufactured by the Phœnix Iron Company of Pennsylvania. Where boiler plate is used it shall be of the best quality, 3-8 inch thick, and fastened with one-half inch rivets in a secure and workmanlike manner; the distance of the rivets from centre to centre not to exceed 2½ inches.

5. The joints, intersections, and footings are to be covered with ornamental iron work, as shown in the drawing; these ornaments are to be securely fitted and fastened to the work. The price for them will be the same per ton as for the plain work.

6. The floor is to rest upon stringers 12 × 16 inches, bolted to the iron work, and upon transverse joists 8 × 15 inches, and four feet from centre to centre, notched upon the stringers; over these, it will be formed of two thicknesses of plank laid at right angles to each other, as shown in the drawing; suitable walk ways and parapet railing and cornice will be provided.

7. The floor will be braced by wooden diagonals and wrought iron rods, after the manner shown.

8. The whole of the materials to be of the best quality of each kind. The timber and plank shall be white pine, except the upper floor, which shall be of oak, free from sap edge, windshakes, unsound knots or spots, or other defects. The carpenter's work to be in the best style. The cast iron to be remelted iron, and the wrought iron refined iron, tough and fibrous, to stand a proof tensile strain of fifty thousand pounds per square inch, in the proving machine belonging to the United States.

9. After its erection and approval the bridge shall be painted by the contractor at his own cost in a proper manner, with four coats of oil paint, of such color as may be directed by the engineer.

10. The test of the bridge, which shall be instituted at the expense of the contractor, with the centres standing but eased and as soon as the bridge is completed, shall be a weight of 125 pounds to the square foot, imposed as the engineer shall find convenient; and, with this load, any leakage, failure, loss, or damage, shall be made good by the contractor at his own expense; it being presumed that no person will undertake this work who is not an expert in the erection of iron structures; and any failure in the bridge, under the test, must result from neglect of proper precaution on his part.

11. The centre for the bridge will be built by the contractor at the expense of the United States, according to the plans to be given by the engineer. The timber and lumber used in it will be taken down and piled by the contractor as may be directed by the engineer, the materials remaining the property of the United States.

PROPOSAL.

12. We propose to furnish the materials and do all the work necessary for the construction and erection of the iron and timber work of the bridge, according to the above specifications, and the directions we may from time to time receive from the engineer, and to his satisfaction and approval, for the following prices, to wit:

13. For cast iron, per ton of $2,240 pounds,.....	$85 00
14. For wrought iron H beams and angle iron, per ton ...	180 00
15. For wrought iron round rods and bolts, per ton.....	200 00
16. For boiler plate, riveted, per ton	155 00
17. For iron railing, per lineal foot.....	6 00
18. For timber and plank on bridge, per foot, board measure.....	5½

19. All work not specified at the estimate of the engineer. The above prices include all workmanship, labor, hauling, carts, horses, machinery, scaffolding, and every expense necessary to the completion of the whole of the iron and wood work, (including the pipes inside of the abutments,) but exclusive of centering, according to the specifications and contract we may hereafter subscribe, a copy of which has been shown to and read by us.

20. Signed by us this 10th day of May, 1858.

A. & W. DENMEAD & SONS.

To Captain M. C. Meigs, United States Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby, jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifi-

cations under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that to the best of my knowledge and belief, the above named guarantors are good and sufficient.

Know all men by these presents, that we, Hugh Sisson and Francis Denmead of the city of Baltimore, State of Maryland, are held and firmly bound unto the United States of America in the full and just sum of eight thousand dollars, lawful money of the United States, to be paid to the said United States or to its proper agent or attorney duly authorized to receive the same; to which payment, well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this 24th day of June, anno Domini one thousand eight hundred and fifty-eight. The condition of the above obligation is such, that if A. & W. Denmead & Sons, their heirs, executors, or administrators, do and shall well and truly execute a contract which they the said A. & W. Denmead & Sons have entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which they have contracted to excavate, construct, and build, at their own proper cost, iron and timber work of bridge No. 6, across Rock creek, of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said A. &. W. Denmead & Sons by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect, otherwise to remain in full force and virtue in law.

HUGH SISSON, [L. S.]
FRANCIS DENMEAD, [L. S.]

Signed, sealed, and delivered in presence of—
JOHN MCELROY.

[Six printed words erased and six written words substituted before signing.]

U. S. COMMISSIONER'S OFFICE, *June* 24, 1858.

I certify that I am acquainted with Hugh Sisson and Francis Denmead, of Baltimore city, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion, sufficient sureties for the purposes mentioned in the within bond

JOHN HANAN,
U. S. Commissioner for Maryland.

WASHINGTON AQUEDUCT.

Contract for water pressure engine.

Agreement between H. R. Worthington, of the State of New York, of the first part, and Captain M. C. Meigs of the Corps of United States Engineers, of the second part, acting under the authority of and for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

1. That the party of the first part, for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish all the materials which may be necessary and which may not be furnished by the United States, and to do all the work in constructing and building water pressure engine for pumping for high service reservoir of the Washington aqueduct, in conformity to the specifications and advertisement annexed hereto, which are to be deemed and taken as a part of this contract, and according to the directions and plans from time to time to be given by the engineer.

2. The principal assistant engineer, or an assistant engineer, by his direction, shall, as soon as practicable after the end of each month, make out an estimate of the quantity and value of each species of work done pursuant to this contract, at the prices contained in the annexed proposal. He shall also include the value of any extra work done in consequence of any alteration of the plan of the work which may have been adopted by the said engineer in charge, when such alteration shall have caused an increased expense to the contractor; and when any such alteration shall have caused a saving of expense to the contractor, the engineer shall make a reasonable deduction therefor from the estimate so made; and if the said engineer in charge of the aqueduct shall approve said estimate, it is mutually agreed between the contracting parties that it shall be binding, and shall be paid by said engineer.

3. Within ten days after the return of any monthly estimate to the engineer in charge, nine-tenths of the sum appearing to be due for work performed since the preceding estimate shall be paid to the contractor.

4. Payments will be made to the contractor in drafts upon the treasury of the United States for coin. No estimate after the first shall be paid, unless the engineer is satisfied that the hands employed upon the work have been paid for the work of the month preceding, as provided in the advertisement under which this contract is made, a copy of which is hereto annexed.

5. Within thirty days after the work shall have been completed and accepted by the engineer, a final estimate therefor shall be made and approved in the manner provided for making and approving monthly estimates, and shall in like manner be paid by said engineer in charge, together with the retained percentage.

6. The work shall always be open to examination during its progress by the engineers or other persons they may depute for that pur-

pose, and the contractor shall, at all times, at his own expense, keep open a pathway alongside of it, so that the above mentioned persons may readily pass by the same to the work above or below it.

7. At the expiration of every two weeks' work a report shall be made by the contractor to the assistant engineer having charge of this work, of the average force of men, carts, &c., employed upon it for the preceding two weeks, according to such forms as shall be supplied by the engineer.

8. It is mutually agreed between the parties to this contract, that the work aforesaid shall be commenced within three days after the notification of the approval of this contract, that it shall be steadily prosecuted without intermission, with such force as shall, in the opinion of the engineer, secure its final completion within five months thereafter, unless prevented or delayed by written orders from the engineer in charge, at the end of which time it shall be fully completed and delivered up; and it is further agreed, that in the event that the said work shall not be commenced, prosecuted, and completed, or if the contractor, on being required thereto by the written order of the engineer in charge, the principal assistant engineer, or his assistant engineer, shall fail or refuse to increase the force employed on the work to such extent as in the opinion of the engineer shall be necessary to insure its completion in the stipulated time, or in case the contractor shall disobey any of the written orders of either of said engineers, or shall violate any of the conditions of this agreement, then on a certificate of the fact by the principal assistant engineer, made to the engineer in charge, the said engineer in charge may declare this contract forfeited, and thereupon the same shall then become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all materials furnished and work performed, and upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States; and the said engineer in charge may thereafter agree with any other person for the execution of the unfinished work, or may complete the same by day's work; and the said party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same, in any place, or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure, refusal, or disobedience; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part and to indemnify and protect the party of the second part from loss in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

9. The contractor for this work shall not knowingly employ any man, either as overseer, laborer, or in any situation, who shall have been dismissed, by the order of the engineer, from any other part of the

work for bad workmanship, intemperance, or disorderly conduct. Nor shall he continue to employ any man who shall be declared by the engineer to be either disorderly, habitually intemperate, or a bad workman.

10. The contractor shall give his personal attention to the execution of the work hereby contracted for.

11. All buildings or fences adjacent to the work shall be preserved, in such manner as the engineer may direct, by the contractor, who shall protect them from injury by his hands and, as far as practicable, by any other person.

12. The engineer shall have the power to prescribe the manner of preparing for, beginning, and conducting every species of work to be done under this agreement with reference to its purpose and the durability of the work, and his instructions shall be promptly obeyed; and if he shall disapprove of the quality of any work, it shall be the duty of the contractor to take down at his own expense and rebuild so much thereof as shall be disapproved of; and if the contractor shall neglect or refuse to take down and rebuild work so disapproved of, the engineer shall cause the same to be done at his cost.

13. It is understood and agreed that all orders given by an engineer which shall cause an increase or diminution in the quantity or value of the work to be performed, shall be given in writing, and that when any claim shall be made by the contractor for extra compensation for work performed under such orders, the orders shall be produced; and that all claims for extra work shall be made on or before the close of the month in which it is claimed to have been done, or it shall not be paid for at all.

14. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

15. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

16. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

17. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed, that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above-recited party of

the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

18. And for the true and faithful performance of all and singular the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves, jointly and severally, their and each of their successors, heirs, executors, and administrators.

19. Thus covenanted and agreed by the said parties this fifth day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

HENRY R. WORTHINGTON, [L. S.]
M. C. MEIGS, [L. S.]
Captain of Engineers,
Chief Engineer Washington Aqueduct.

[Done in quadruplicate.]
Witnesses.
DAUPHINE S. HINES,
CHARLES C. BARTON.

Z. W. DENHAM,
As to signature of Capt. Meigs.

WASHINGTON AQUEDUCT.

Specification of water pressure engine for pumping for high service at Georgetown.

1. This engine will be duplex; one portion moving the valves of the other; double-acting, upon the principle of Henry R. Worthington's patent of 1855.

2. The motive pistons will be ten inches diameter, and the pumping plungers of such size that the machine shall work at the velocity of eighty feet per minute.

3. All the working parts of the machine, and all surfaces in contact with them, are to be composition; the remainder to be wrought and cast iron.

4. The whole to be built in accordance with the plans, of the best materials and in the most workmanlike manner, and set up upon foundations prepared in a vault, in the abutment of the Rock creek bridge, complete, (ready for the connections to the acting, supply, waste, and delivery mains,) by the contractor.

PROPOSAL.

5. The subscriber offers to contract to construct and set up the water pressure engine at the following price, according to the preceding specification, and upon the terms and conditions stipulated in the

contract which he may hereafter subscribe, in the form a copy of which has been shown to and read by him:

6. For the engine set up complete and in action, $4,000.
7. Signed by me this tenth day of May, 1858.

HENRY R. WORTHINGTON.

To Captain M. C. Meigs, United States Engineers:

We, the undersigned, residents of Brooklyn, in the State of New York, hereby, jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of Henry R. Worthington be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said Henry R. Worthington shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said Henry R. Worthington and the next lowest bidders.

A. WORTHINGTON,
ANTHONY WORTHINGTON.

I hereby certify that to the best of my knowledge and belief, the above named guarantors are good and sufficient.

D. N. PERRY.

Know all men by these presents, that we, Joseph Nason and John C. Dodge, of New York, State of New York, are held and firmly bound unto the United States of America in the full and just sum of sixteen hundred dollars lawful money of the United States, to be paid to the said United States or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this fifth day of June, anno Domini, one thousand eight hundred and fifty-eight. The condition of the above obligation is such, that if H. R. Worthington, his heirs, executors, or administors, do and shall well and truly execute a contract which he, the said H. R. Worthington has entered into with Captain Montgomery C. Meigs of the United States corps of engineers, for and in behalf of the United States, by which he has contracted to excavate, construct, and build, at its own proper cost, water pressure engine for pumping for high service reservoir (at Georgetown) of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said H. R. Worthington by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect; otherwise to remain in full force and virtue in law.

JOSEPH NASON, [L. S.]
JOHN C. DODGE, [L. S.]

Signed, sealed, and delivered in presence of—
CHARLES C. BARTON.

WASHINGTON AQUEDUCT OFFICE,
Washington, June 7, 1858.

I certify that I am acquainted with the firm of Nason & Dodge, of New York, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion sufficient sureties for the purposes mentioned in the within bond.

M. C. MEIGS.

WASHINGTON AQUEDUCT.

Contract for pipes, cement, or other materials.

1. Agreement between Lawrence Myers, of Philadelphia, in the State of Pennsylvania, of the first part, and Captain M. C. Meigs of the Corps of United States Engineers, of the second part, acting for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

2. That the party of the first part for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish and deliver at the proper cost of the said party of the first, upon such wharf or wharves in Washington and Georgetown, and at such time as may be designated by the party of the second part, or upon lighters or scows in the harbor of Washington or Georgetown, D. C., all the cast iron pipes, branches, bends, and sleeves, described and referred to in the printed specifications and proposals, a copy of which is annexed to and is to be deemed and taken as a part of this contract, and to do the same in conformity to said specifications and proposal, and to the directions he may from time to time receive from the engineer.

3. And the party of the second part for and in consideration of the premises, covenants and agrees to pay to the party of the first part, for all the pipes, branches, bends, and sleeves which shall have been delivered by the said party of the first part, under and in conformity with the terms of this contract and proposal, and which shall have been inspected and accepted by the said party of the second part, at the rates specified in the said proposal and specifications hereto attached.

4. Provided, nevertheless, that in case the party of the second part shall at any time be of opinion that this contract is not duly complied with by the party of the first part, or that it is not in due progress of execution, or that the party of the first part is irregular or negligent, in such case he shall be authorized to declare this contract forfeited, and thereupon the same shall become null and void, and the United States shall thereupon be exonerated from every obliga-

tion thence arising; and the reserved per centage on the contract price, as well as all the materials furnished upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States; and the party of the second part may thereafter agree with any other person for the execution of the remainder of the work; and the party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same, in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure or refusal; and it is further agreed between the parties that, in order to secure the punctual performance of the covenants above made by the party of the first part and to indemnify and protect the party of the second part from loss in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

5. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

6. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

7. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

8. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress approved April 14, 1852, containing a proviso in the following terms, to wit: "*Provided*, nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

9. And for the true and faithful performance of all and singular the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves jointly and severally their and each of their successors, heirs, executors, and administrators.

10. Thus covenanted and agreed by the said parties this eleventh day of June, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

LAWRENCE MYERS, [L. S.]
M. C. MEIGS, [L. S.]
Captain of Engineers,
Chief Engineer Washington Aqueduct.

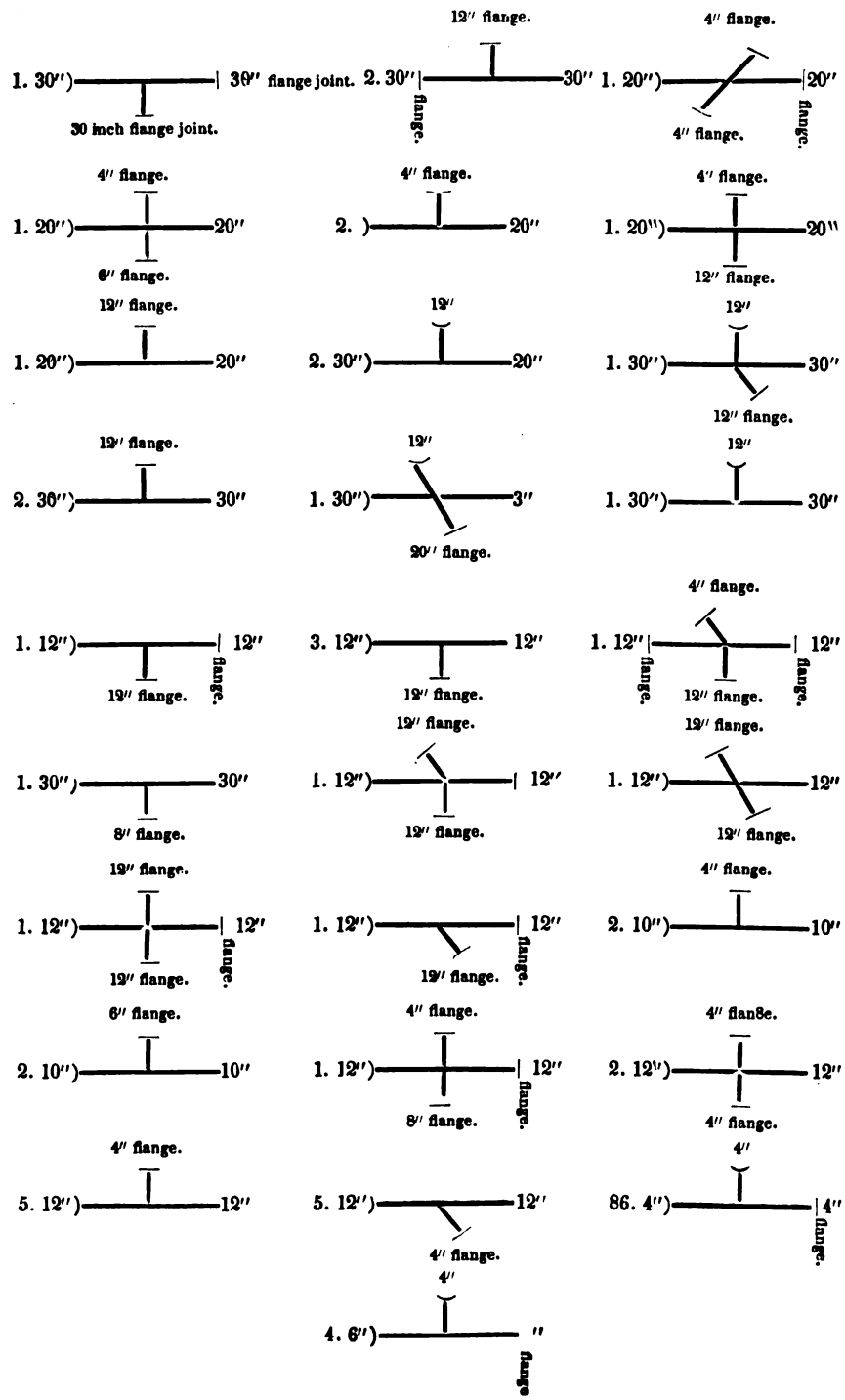
[Done in quadruplicate.]
Witnesses—
DANIEL S. GRICE,
As to Lawrence Myers.
Z. W. DENHAM,
As to signature of Captain Meigs.

WASHINGTON AQUEDUCT.

Specifications for cast-iron pipes.

1. Sealed proposals will be received at the office of the Washington aqueduct, Washington, till the 11th of May, 1858, for the following cast-iron pipes, branches, and bends, viz:

2280 pipes, 12 ft. long, 30 inches interior diameter, 1.03 in. thickness.
330 pipes, 12 ft. long, 20 inches interior diameter, 0.77 in. thickness.
473 pipes, 12 ft. long, 10 inches interior diameter, 0.51 in. thickness.
254 pipes, 9 ft. long, 8 inches interior diameter, 0.46 in. thickness.
69 pipes, 9 ft. long, 6 inches interior diameter, 0.41 in. thickness.
287 pipes, 9 ft. long, 4 inches interior diameter, 0.35 in. thickness.


1. 30″)
30″ flange joint.
30 inch flange joint.
12″ flange.
2. 30″)
30″
flange.
4″ flange.
1. 20″)
20″
4″ flange.
flange.
4″ flange.
1. 20″)
20″
6″ flange.
4″ flange.
2.)
20″
4″ flange.
1. 20″)
20″
12″ flange.
12″ flange.
1. 20″)
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2. 30″)
20″
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12″ flange.
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2. 30″)
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3. 12″)
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12″ flange.
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flange.
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flange.
1. 30″)
30″
8″ flange.
12″ flange.
1. 12″)
12″
12″ flange.
12″ flange.
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2. 10″)
10″
6″ flange.
2. 10″)
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8″ flange.
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2. 12″)
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5. 12″)
12″
5. 12″)
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4″ flange.
4″
86. 4″)
4″
flange.
4″
4. 6″)
″
flange

2. Angles of skew branches 69° and 111°.

3. Also 2 30-inch bends, 15 feet radius, 45°; 2 30-inch bends, 15 feet radius, 26°; 2 30-inch bends, 15 feet radius, 34½°; 1 30-inch bend, 15 feet radius, 28°; 1 12-inch bend, 6 feet radius, 26°; 1 12-inch bend, 6 feet radius, 28°; 1 12-inch elbow, 6 feet radius, 90° flange joint; 2 20-inch elbows, 10 feet radius, 70°; 2 20-inch elbows, 10 feet radius, 45°; 1 10-inch elbow, 5 feet radius, 64°; 2 10-inch elbow, 5 feet radius, 90°; 1 10-inch elbow, 5 feet radius, 69°; 1 8-inch elbow, 4 feet radius, 90°; 1 4-inch elbow, 90°, with flanges; 4 30-inch flange pipes; 1 20-inch flange pipe; 17 12-inch flange pipes; 2 10-inch flange pipes; 3 8-inch flange pipes; 7 6-inch flange pipes; 86 4-inch flange pipes; 60 sleeves for 30-inch pipes; 5 sleeves for 20-inch pipes; 150 sleeves for 12-inch pipes; 20 sleeves for 10-inch pipes; 20 sleeves for 8-inch pipes; 20 sleeves for 6-inch pipes; 150 sleeves for 4-inch pipes.

4. The size named to be inside diameter, and each pipe over 8 inches diameter to be 12 feet in length; 8-inch pipe and under to be in 12 feet lengths.

5. The joint to be what is termed the spigot and faucet joint, excepting where otherwise specified.

6. The reducing pieces, stops, and such of the pipes as specified, to have strong lugs or horns cast on each end for fastening them together with wrought-iron links.

7. The spigot ends of all the branches, and both ends of the bends to have similar lugs.

8. The average weight of the pipes of each sort not to exceed their calculated weight, by the dimensions given by the engineer, more than three per cent.; none to weigh less than the calculated weight. If the total weight of all the pipes exceeds the average, the excess will not be paid for. All the pipes to pass the usual inspection and proof of 300 pounds to the square inch; to be of uniform thickness throughout, of strong, tough iron, free from all imperfections whatever, and such as will bear drilling and cutting.

9. Proposals will state whether the pipes are to be from blast furnace iron or re-melted iron; and, if from blast furnace iron, will specify the name of the mine, &c., and ore used.

10. The pipes to be delivered on such wharf as may be designated by the engineer, in Washington or Georgetown, D. C.

11. All the pipes, branches, bends, &c., specified to be delivered by 1st October, 1858.

12. The branches to be delivered in due proportion with the pipes, as required, from time to time.

13. A specific price per ton of 2,240 lbs. to be named for the pipes and branches and bends.

14. Payments will be made in cash, by checks for coin on the United States Treasury, immediately after the inspection and proof of each parcel is completed—reserving 10 per cent. until the completion of the contract.

15. All the pipes to conform in dimensions and in every particular to the drawings to be furnished by the engineer.

PROPOSAL.

The subscriber offers to contract for furnishing the above-
ed pipes, branches, bends, &c , in conformity to the preceding
ations, and upon the terms and conditions stipulated in the
t which he may hereafter subscribe, in the form a copy of which
n shown to and read by him, at the prices following, to wit:

r 30-inch pipes, per ton of 2240 lbs.....	$38 85
r 20-inch pipes.....do.....	38 85
r 10-inch pipes.....do.....	38 85
r 8-inch pipes.....do.....	38 85
r 6-inch pipes.....do.....	38 85
r 4-inch pipes.....do.....	38 85
r bends.....do.....	40 12
r branches .....do.....	40 12
r sleeves.....do.....	40 12

Signed by me, this 7th day of May, 1858.

LAWRENCE MYERS.

ptain M. C. Meigs, U. S. Engineers:

, the undersigned, residents of ———, in the State of ———,
jointly and severally covenant with the United States, and
ity, in case the foregoing bid of ——— be accepted, that he or
ill, within ten days after the acceptance of the said bid, execute
ract for the same, with good and sufficient sureties, to perform
rk in conformity to the terms of the advertisement and specifi-
s under which it was made. And in case the said ——— shall
enter into contract as aforesaid, we guaranty to make good the
nce between the offer by the said ——— and the next lowest
s.

reby certify that to the best of my knowledge and belief, the
named guarantors are good and sufficient.

E.—Pipes, bends, branches, and sleeves, to be made of remelted

LAWRENCE MYERS.

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w all men by these presents, that we, Alfred Day and Samuel
ice, of Philadelphia, State of Pennsylvania, are held and firmly
unto the United States of America in the sum of fifty thousand
s lawful money of the United States of America, to be paid to
id United States of America or to its proper agent or certain
ey duly authorized to receive the same; to which payment, well
uly to be made and done, we bind ourselves and every one of us
nd every of our heirs, executors, and administrators, in the
and for the whole, jointly and severally, firmly by these pre-

sents. Sealed with our seals and dated the 11th day of June, in the year of our Lord 1858.

The condition of the above obligation is such, that if Lawrence Myers, his heirs, executors, or administrators, do and shall well and truly execute a contract which he, the said Lawrence Myers, has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to furnish and deliver, at his own proper cost, cast iron pipes, branches, bends, and sleeves, of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said Lawrence Myers by said Captain M. C. Meigs or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect, otherwise, to remain in full force and virtue in law.

Two words erased before signing.

ALFRED DAY, [L. S.]
SAM. B. GRICE, [L. S.]

Signed, sealed, and delivered, in presence of—
TOBIAS HUBER.

UNITED STATES NAVY AGENT'S OFFICE,
June 11, 1858.

I certify that I am acquainted with Alfred Day and Samuel B. Grice, of Philadelphia, the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion, sufficient sureties for the purposes mentioned in the within bond.

WM. BADGER, *Navy Agent.*

WASHINGTON AQUEDUCT.

Contract for stop-cocks.

1. Agreement between Asahel Sylvester, of Boston, in the State of Massachusetts, of the first part, and Captain M. C. Meigs of the Corps of United States Engineers, of the second part, acting for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

2. That the party of the first part, for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish and deliver, at the proper cost of the said party of the first part, upon such wharf or wharves in Washington and Georgetown and at such time as may be designated by the party of the second part, or upon lighters or scows in the harbor of Washington or Georgetown, D. C., all the stopcocks described and referred to in the printed specifications and proposals, a copy of which is annexed to and is to be deemed and taken as a part of this

contract, and to do the same in conformity to said specifications and proposal, and to the directions he may from time to time receive from the engineer.

3. And the party of the second part for and in consideration of the premises, covenants and agrees to pay to the party of the first part, for all stopcocks which shall have been delivered by the said party of the first part, under and in conformity with the terms of this contract and proposal, and which shall have been inspected and accepted by the said party of the second part, at the rates specified in the said proposal and specifications hereto attached

4. Provided, nevertheless, that in case the party of the second part shall at any time be of opinion that this contract is not duly complied with by the party of the first part, or that it is not in due progress of execution, or that the party of the first part is irregular or negligent, in such case he shall be authorized to declare this contract forfeited, and thereupon the same shall become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved percentage on the contract price, as well as all the materials furnished upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States; and the party of the second part may thereafter agree with any other person for the execution of the remainder of the work; and the party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same, in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure or refusal; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

5. It is further agreed that in case of the death, resignation, removal, or absence of any engineer, the United States by its proper officers, may depute any other engineer to act in his place.

6. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

7. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress passed on the 21st day of April, in the year of our Lord 1808, entitled "An act concerning public contracts."

8. And this contract is also expressly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14, 1852, containing a proviso in the following terms, to wit:

"*Provided*, nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, That it is expressly understood and agreed, that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above-recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

9. And for the true and faithful performance of all and singular the convenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves jointly and severally, their and each of their successors, heirs, executors, and administrators.

10. Thus covenanted and agreed by the said parties this 9th day of June, in the year of our Lord one thousand eight hudred and fifty-eight, (1858,) as witness their hands and seal.

[Done in quadruplicate]

ASAHEL SYLVESTER, [L. S.]
M. C. MEIGS, [L. S.]
Captain of Engineers, Chief Engineer Washington Aqueduct.

WM. P. HUNT,
Witness to Asahel Sylvester.
Z. W. DENHAM,
Witness as to signature of Captain Meigs.

WASHINGTON AQUEDUCT.

Specification of stopcocks and hydrants.

1. Proposals will be received at this office until the 11th May, for the stopcocks and hydrants for the Washington aqueduct, as follows:

2. To be made in the best workmanlike manner, and of the best materials; to stand a hydraulic proof of 300 lbs. per square inch, and to be made in all respects according to the drawings to be furnished by the engineer.

3. Stuffing boxes, stems, screws, nuts, valve facings, or the valves themselves, and the valve seats to be of composition.

4. All cocks over 10 inches diameter, to be geared and arranged to work horizontally.

5. Those 10 inches and under to work vertically.

6. The hydrants to have conical valves, wastes, and all the best arrangements for attaching fire-hose and for drawing water for domestic purposes, as shown in the drawings.

7. The hydrant cases to be of cast iron.

8. All to be delivered complete by November 1, 1858, on such

wharf in Washington or Georgetown, D. C., as may be designated by the engineer.

9. Payments will be made in cash by checks upon the United States treasury, after the inspection and proof of each parcel is completed, reserving 10 per cent. until the completion of the contract.

10. The following is a list of the stopcocks and hydrants to be delivered under this specification:

5 thirty-inch stopcocks.
1 twenty-inch stopcock.
22 twelve-inch stopcocks.
1 ten-inch stopcock.
9 eight-inch stopcocks.
15 six-inch stopcocks.
150 four-inch stopcocks.

PROPOSAL.

11. The subscriber offers to furnish the above stopcocks and hydrants, and any others that may be needed for the Washington aqueduct, in conformity with the terms of these specifications and of the contract which he may hereafter sign, in the form a copy of which has been shown to and read by him, at the following prices, to wit:

12.	For each thirty-inch stopcock, complete	$400
13.	For each twenty-inch stopcock, complete	180
14.	For each twelve-inch stopcock, complete	80
15.	For each ten-inch stopcock, complete	65
16.	For each eight-inch stopcock, complete	45
17.	For each six-inch stopcock, complete	30
18.	For each four-inch stopcock, complete	18

20. Signed by me, this eleventh day of May, 1858.

ASAHEL SYLVESTER.

To Captain M. C. Meigs, U. S. Engineers:

We, the undersigned, residents of Boston, in the State of Massachusetts, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of Asahel Sylvester be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said Asahel Sylvester shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said Asahel Sylvester and the next lowest bidders.

FRANCIS ALGER,
WM. P. HUNT.

I hereby certify that to the best of my knowledge and belief, the above named guarantors are good and sufficient.

NAHUM CAPEN.

Know all men by these presents, that we, Francis Alger and Wm. P. Hunt, of Boston, State of Massachusetts, are held and firmly bound unto the United States of America in the full and just sum of

three thousand dollars, lawful money of the United States, to be paid to the said United States or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this ninth day of June, anno Domini one thousand eight hundred and fifty-eight.

The condition of the above obligation is such that, if Asahel Sylvester, his heirs, executors, or administrators, do and shall well truly execute a contract which he, the said Asahel Sylvester, has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to excavate, construct, and build and deliver, at his own proper cost, stopcocks of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said Asahel Sylvester by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect; otherwise to remain in full force and virtue in law.

FRANCIS ALGER, [L. S]
WM. P. HUNT, [L. S.]

Signed, sealed, and delivered in presence of—
W. F. KENNEDY.

Two written words interlined before signature.

POST OFFICE, BOSTON, MASS., *June* 9, 1858.

I certify that I am acquainted with Francis Alger and Wm. P. Hunt, of Boston, Mass., the sureties named in the above bond, and that they are severally freeholders and residents as aforesaid, and in my opinion sufficient sureties for the purposes mentioned in the within bond.

NAHUM CAPEN.

WASHINGTON AQUEDUCT.

Contract for pipes, cement, or other materials.

1. Agreement between R. F. Jackson, of Georgetown, in the District of Columbia, of the first part, and Captain M. C. Meigs, of the Corps of United States Engineers, of the second part, acting for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

2. That the party of the first part, for and in consideration of the matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish and deliver at the proper cost of the said party of the first part, upon such wharf or wharves in

Washington and Georgetown and at such time as may be designated by the party of the second part, or upon lighters or scows in the harbor of Washington or Georgetown, D. C., 160 thousand bushels of sand, (one hundred and sixty thousand bushels,) or such less quantity as may be required from him described and referred to in the printed specifications and proposals, a copy of which is annexed to and is to be deemed and taken as a part of this contract, and to do the same in conformity to said specifications and proposal and to the directions he may from time to time receive from the engineer.

3. And the party of the second part for and in consideration of the premises, covenants and agrees to pay to the party of the first part, for all the sand as aforesaid which shall have been delivered by the said party of the first part, under and in conformity with the terms of this contract and proposal, and which shall have been inspected and accepted by the said party of the second part, at the rates specified in the said proposal and specifications hereto attached.

4. Provided, nevertheless, that in case the party of the second part shall at any time be of opinion that this contract is not duly complied with by the party of the first part, or that it is not in due progress of execution, or that the party of the first part is irregular or negligent, in such case he shall be authorized to declare this contract forfeited, and thereupon the same shall become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved percentage on the contract price, as well as all the materials furnished upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States; and the party of the second part may thereafter agree with any other person for the execution of the remainder of the work; and the party of the first part shall have no appeal from the opinion and decision aforesaid, and he hereby releases all right to except to or question the same, in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure or refusal; and it is further agreed between the parties, that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

5. It is further agreed that in case of death, resignation, removal, or absence of any engineer, the United States, by its proper officers, may depute any other engineer to act in his place.

6. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faithfully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

7. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agree-

ment, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

8. And this contract is also expressly understood to be subjeet to the terms and conditions of the joint resolution of Congress, approved April 14th, 1852, containing a proviso in the following terms, to wit: "*Provided*, nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, that it is expressly understood and agreed, that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above-recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

9. And for the true and faithful performance of all and singular, the covenants, articles, and agreements hereinbefore particularly set forth, the subscribers hereunto bind themselves jointly and severally, their and each of their successors, heirs, executors, and administrators.

10. Thus covenanted and agreed by the said parties this thirty-first day of May, in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

RICHARD F. JACKSON, [SEAL.]
M. C. MEIGS, [SEAL.]
Captain of Engineers, Chief Engineer Washington Aqueduct.

Done in quadruplicate.
Witnesses—
H. W. TILLEY.

Z. W. DENHAM,
As to signature of Captain Meigs.

WASHINGTON AQUEDUCT.

Specifications for sand.

1. Proposals will be received for furnishing sand for the Washington aqueduct.

2. None but good clean sharp flint or silicious sand will be received.

3. It must be delivered into bins which will be prepared to receive it on the berm-bank of the Chesapeake and Ohio canal, adjacent to the line of the Washington aqueduct; and it will be measured in these bins.

4. Proposals will state the quantity which the bidder will undertake to deliver during this season, stating the rate of delivery per

month, and the greatest and the least quantity for which he will contract.

5. The proposals may be for any quantity not exceeding three hundred and fifty thousand bushels.

6. The engineer will designate the particular bin into which any load of sand is to be delivered.

PROPOSAL

7. The subscriber offers to contract for furnishing for the Washington aqueduct not exceeding three hundred and twenty thousand bushels of sand, at the price hereinafter stated, and the times and quantities of the following table, and to complete the delivery of the said sand, in conformity to the terms of the preceding specifications, and upon the terms and conditions of the contract which he may hereafter subscribe, in the form a copy of which has been shown to and read by him.

8. For sand, per bushel, 4½ cents.

9. Thirty thousand bushels to be delivered by first of June, 1858; 20,000 bushels more, to be delivered by the first of July, 1858; 30,000 bushels more, to be delivered by the first of August, 1858; 30,000 bushels more, to be delivered by the first of September, 1858; 30,000 bushels more, to be delivered by the first of October, 1858; 30,000 bushels more, to be delivered by the first of November, 1858; 30,000 bushels more, to be delivered by the first of December, 1858; 20,000 bushels more, to be delivered by the first of January, 1859; 30,000 bushels more, to be delivered by the first of March, 1859; 20,000 bushels more, to be delivered by the first of April, 1859; 20,000 bushels more, to be delivered by the first of May, 1859; 30,000 bushels more, to be delivered by the first of June, 1859.

10. Signed by me this tenth day of May, 1858.

RICH'D F. JACKSON.

To Captain M. C Meigs, U. S. Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that, to the best of my knowledge and belief, the above named guarantors are good and sufficient.

Know all men by these presents, that we William V. Bouic, of Montgomery county, Maryland, and Richard H. Trunnell, of Georgetown, District of Columbia, are held and firmly bound unto the United

States of America in the full and just sum of five thousand dollars lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this thirty-first day of May, anno Domini one thousand eight hundred and fifty-eight. The condition of the above obligation is such that if R. F. Jackson, his heirs, executors, or administrators, do and shall well and truly execute a contract which he the said R. F. Jackson has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to furnish and deliver at his own proper cost, (160,000) one hundred and sixty thousand bushels of good, clean sharp silicious sand, or so much thereof as may be required from him for the use of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said R. F. Jackson by said M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect, otherwise to remain in full force and virtue in law.

W. VEIRS BOUIC. [SEAL.]
RICHARD H. TRUNNELL. [SEAL.]

Six printed words erased and three written words inserted before signing.

Signed, sealed, and delivered in presence of—
H. W. TILLEY.

UNITED STATES COMMISSIONER'S OFFICE, *May* 31, 1858.

I certify that I am acquainted with W. Veirs Bouic and Richard H. Trunnell, of aforesaid, the sureties named in the above bond, and they are severally freeholders and residents aforesaid, and in my opinion sufficient sureties for the purposes mentioned in the within bond.

H. W. TILLEY,
Postmaster.

WASHINGTON AQUEDUCT.

Contract for pipes, cement, or other materials.

1. Agreement between H. C. Mitchell, of Washington City, in the District of Columbia of the first part, and Captain M. C. Meigs of the corps of United States Engineers, of the second part, acting for and in behalf of the United States of America, as engineer in charge of the Washington aqueduct, witnesseth:

2. That the party of the first part, for and in consideration of the

matters hereinafter referred to and set out, covenants and agrees with the party of the second part to furnish and deliver at the proper cost of the said party of the first part, upon such wharf or wharves in Washington and Georgetown, and at such time as may be designated by the party of the second part, or upon lighters or scows in the harbor of Washington or Georgetown, D. C., all the one hundred and sixty thousand bushels of sand, or so much less as may be required, described and referred to in the printed specifications and proposals, a copy of which is annexed to and is to be deemed and taken as a part of this contract, and to do the same in conformity to said specifications and proposal, and to the directions he may from time to time receive from the engineer.

3. And the party of the second part for and in consideration of the premises, covenants and agrees to pay to the party of the first part for all the sand which shall have been delivered by the said party of the first part, under and in conformity with the terms of this contract and proposal, and which shall have been inspected and accepted by the said party of the second part, at the rates specified in the said proposal and specifications hereto attached.

4. Provided, nevertheless that in case the party of the second part shall at any time be of opinion that this contract is not duly complied with by the party of the first part, or that it is not in due progress of execution, or that the party of the first is irregular or degligent, in such case he shall be authorized to declare this contract forfeited, and thereupon the same shall become null and void, and the United States shall thereupon be exonerated from every obligation thence arising; and the reserved per centage on the contract price, as well as all the materials fnrnished upon which no estimate or payment may have been made, shall be forfeited to and become the right and property of the United States; and the party of the second part may thereafter agree with any other person for the execution of the remainder of the work; and the party of the first part shall have no appeal from the opinion and decision aforesaid; and he hereby releases all right to except to or question the same, in any place or under any circumstances whatever; but the party of the first part shall still remain liable to the party of the second part for the damages occasioned to him by the said failure or refusal; and it is further agreed between the parties that in order to secure the punctual performance of the covenants above made by the party of the first part, and to indemnify and protect the party of the second part from loss in case of default and forfeiture of this contract, the said party of the second part shall be authorized to retain in his hands, until the completion of the contract, *ten per cent.* on the amount of moneys at any time due to the said party of the first part.

5. It is further agreed that in case of death, resignation, removal, or absence of any engineer, the United States by its proper officers, may depute any other engineer to act in his place.

6. The United States reserves the right to suspend the work under this contract at any time; and when the work has been faith-

fully performed by the contractor, he will be paid in full for all work done up to the time of such suspension.

7. And it is further stipulated and agreed that no member of Congress shall be admitted to any share or part in this contract or agreement, or to any benefits to arise therefrom; and this contract shall be in all its parts subject to the terms and conditions of an act of Congress, passed on the twenty-first day of April, in the year of our Lord one thousand eight hundred and eight, entitled "An act concerning public contracts."

8. And this contract is also expresly understood to be subject to the terms and conditions of the joint resolution of Congress, approved April 14th, 1852, containing a proviso in the following terms, to wit: "*Provided*, nothing herein contained shall be so construed as to authorize any officer of the United States to bind the United States by contract beyond the amount appropriated by Congress, or to sanction any such contract heretofore made;" *Provided, also*, that it is expressly understood and agreed, that this contract, nor any part thereof, shall not be sublet nor assigned; but that it shall be well and truly carried out and fulfilled in good faith by the above recited party of the first part, and that all payments on account thereof shall be made to the aforesaid party of the first part, his heirs, executors, or administrators.

9. And for the true and faithful performance of all and singular the covenants, articles, and agreements hereinbefore particularly set forth the subscribers hereunto bind themselves jointly and severally, their and each of their successors, heirs, executors, and administrators.

10. Thus convenanted and agreed by the said parties this tenth day of June in the year of our Lord one thousand eight hundred and fifty-eight, (1858,) as witness their hands and seals.

H. C. MITCHELL, [L. S.]
M. C. MEIGS, [L. S.]
Captain of Engineers, Chief Engineer Washington Aqueduct.

[Done in quadruplicate.]
Witnesses—
As to H. C. Mitchell's signature.
C. G. LOUNDS.
As to signature of Captain Meigs.
Z. W. DENHAM.

WASHINGTON AQUEDUCT.

Specifications for sand.

1. Proposals will be received for furnishing sand for the Washington aqueduct.

2. None but good clean sharp flint or silicious sand will be received.

3. It must be delivered into bins, which will be prepared to receive

it on the berm-bank of the Chesapeake and Ohio canal, adjacent to the line of the Washington aqueduct; and it will be measured in these bins.

4. Proposals will state the quantity which the bidder will undertake to deliver during this season, stating the rate of delivery per month, and the greatest and the least quantity for which he will contract.

5. The proposals may be for any quantity not exceeding three hundred and fifty thousand bushels.

6. The engineer will designate the particular bin into which any load of sand is to be delivered.

PROPOSAL.

7. The subscriber offers to contract for furnishing for the Washington aqueduct from — thousand to 320 thousand bushels of sand at the price hereinafter stated, and in the times and quantities of the following table; and to complete the delivery of the said sand in conformity to the terms of the preceding specifications, and upon the terms and conditions of the contract which he may hereafter subscribe, in the form a copy of which has been shown to and read by him.

8. For sand, per bushel, 4½ cents.

9. Thirty thousand bushels to be delivered by 1st of June, 1858; 20,000 bushels more to be delivered by 1st of July, 1858; 30,000 bushels more to be delivered by 1st of August, 1858; 30,000 bushels more to be delivered by 1st of September, 1858; 30,000 bushels more to be delivered by 1st of October, 1858; 30,000 bushels more to be delivered by 1st of November, 1858; 30,000 bushels more to be delivered by 1st of December, 1858; 20,000 bushels more to be delivered by 1st of January, 1859; 30,000 bushels more to be delivered by 1st of March, 1859; 20,000 bushels more to be delivered by 1st of April, 1859; 20,000 bushels more to be delivered by 1st of May, 1859; 30,000 bushels more to be delivered by 1st of June, 1859

10. Signed by me this eleventh day of May, 1858.

H. C. MITCHELL.

To Captain M. G. Meigs, U. S. Engineers:

We, the undersigned, residents of ———, in the State of ———, hereby jointly and severally covenant with the United States, and guaranty, in case the foregoing bid of ——— be accepted, that he or they will, within ten days after the acceptance of the said bid, execute a contract for the same, with good and sufficient sureties, to perform the work in conformity to the terms of the advertisement and specifications under which it was made. And in case the said ——— shall fail to enter into contract as aforesaid, we guaranty to make good the difference between the offer by the said ——— and the next lowest bidders.

I hereby certify that to the best of my knowledge and belief, the abovenamed guarantors are good and sufficient.

Know all men by these presents, that we, Geo. H. Plant, U. B. Mitchell, and H. C. Mitchell, of Washington, District of Columbia, are held and firmly bound unto the United States of America in the full and just sum of twenty-five hundred dollars, lawful money of the United States, to be paid to the said United States, or to its proper agent or attorney duly authorized to receive the same; to which payment well and truly to be made and done, we bind ourselves and every of us, our and every of our heirs, executors, and administrators, in the whole and for the whole, jointly and severally, firmly by these presents. Sealed with our seals, and dated this —— day of June anno Domini, one thousand eight hundred and fifty-eight. The condition of the above obligation is such, that if H. C. Mitchell, his heirs, executors, or administrators, do and shall well and truly execute a contract which he the said H. C. Mitchell has entered into with Captain Montgomery C. Meigs, of the United States Corps of Engineers, for and in behalf of the United States, by which he has contracted to furnish and deliver, at his own proper cost, (160 M.) one hundred and sixty thousand bushels of good clean sharp flint or silicious sand, or so much less as may be required of the Washington aqueduct, according to the specifications and such directions as may from time to time be given to said H. C. Mitchell by said Captain M. C. Meigs, or his assistant engineers, the said contract being hereunto annexed, then the foregoing obligation to be void and of no effect, otherwise to remain in full force and virtue in law.

H. C. MITCHELL, [L. S.]
GEORGE H. PLANT, [L. S.]
U. B. MITCHELL, [L. S.]

Signed, sealed, and delivered in presence of—

The words State of, excavate, construct and build, erased, and the words furnish and deliver, interlined before signing.

UNITED STATES MARSHAL'S OFFICE,
June 10, 1858.

I certify that I am acquainted with George H. Plant, one of the sureties named in the above bond, and that he is a freeholder and resident aforesaid, and in my opinion sufficient surety for the purposes mentioned in the within bond.

W. SELDEN,
U. S. Marshal.

I am personally acqainted with Mr. U. B. Mitchell, and consider him responsible for the above bond.

J. H. GODDARD.

XXIII.

REPORT OF THE CHIEF TOPOGRAPHICAL ENGINEER.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, November 11, 1858.

SIR: I have the honor to submit a report of the operations conducted by this bureau, since the annual report of November 23, 1857.

1*st. Stations and Duties of the Officers of the corps have been as follows:*

Lieutenant Colonel James Kearney has been assigned to the duty of collecting required materials for a chart of Lake Ontario. His report is appended, marked A.

Major (Brevet Lieutenant Colonel) Long, stationed at St. Louis, in in charge of the western river improvements; of the improvements of the Southwest Pass and Pass à l'Outre, Mississippi river; of the improvements of Red river, and of the construction of the military roads in Kansas and Nebraska. His report is appended, marked B.

Major (Brevet Major) Bache, stationed at San Francisco, California, in charge of the construction of light-houses on the entire Pacific Coast of the United States, embracing California, and Oregon and Washington Territories; and superintending until the month of July last, the construction of military roads in Oregon and Washington Territories.

Major (Brevet Lieutenant Colonel) J. D. Graham, stationed at Chicago, Illinois, in charge of the harbor improvements on Lakes Michigan, St. Clair, Erie, Ontario and Champlain. His report for the current year has not yet been received. For the latest information of the condition of these works, I ask your reference to his last annual report, Senate Executive Document, No. 42; 35th Congress, 1st session.

Major Campbell Graham, last stationed in San Francisco as assistant to Major Bache, has returned from California, and is now awaiting at Baltimore further assignment to duty.

Captain Cram, stationed at headquarters department of the east, under the command of General Wool, was engaged in the preparation of the reports of the operations in the department of the Pacific until the 17th of March, when he was assigned to duty on the Coast Survey.

Captain Stansbury, on sick leave until April 20th when he was ordered to relieve Captain Thom, of the construction of military roads in Minnesota. His report is appended, marked D.

Captain Humphreys, stationed at Washington on duties connected with Pacific railroad surveys, member of the Light-house Board and in charge of the examinations of the inundations of the Mississippi river. His report of operations during the year is appended, marked E.

Captain Macomb, stationed at Santa Fé, New Mexico, on duty at headquarters department of New Mexico, and in charge of the con-

struction of military roads in that Territory. His report is appended. marked F.

Captain Simpson, on duty on the Coast Survey until February 11. 1858, when he was assigned to duty with the army in Utah. He is now at headquarters of that department. In addition to his other duties, he is charged with geographical surveys, &c. His report is herewiih appended, marked O.

Captain Sitgreaves, stationed at Baltimore, is in charge of the construction of light-houses in Chesapeake bay, under the orders of the Treasury Department.

Captain Woodruff, stationed at Washington, on duty as assistant to the Burean of Topographical Engineers.

Captain Palmer, is on duty on the Coast Survey, and assistant in charge of office since July, 1858.

Captain Thom, until recently in charge of military roads in Minnesota, is in charge of the construction of military roads in Oregon and Washington Territories, and is also under orders to report for duty at the headquarters department of Oregon. His report is appended, marked C.

Captain Whipple, stationed at Detroit, Michigan, in charge of the improvements of the St. Clair flats and flats of Lake George, St. Mary's river; of the construction of a light-house and beacon on St. Clair flats, and of light-houses on lakes Erie and Ontario. His report is appended, marked H.

Captain Meade, stationed at Detroit, Michigan, in charge of the survey of the northern and northwestern lakes. His report is appended, marked I.

Captain L. M. Smith, on duty on the Coast Survey.

Captain Pope, on duty in northern Texas, connected with the sinking of artesian wells.

Captain Abert, on duty with the troops in Florida until January 27, 1858; then assigned to duty with the army of Utah, and on May 15, 1858, assigned to duty in connexion with improvement of western rivers. His report is appended, marked K.

Captain Franklin, stationed at Washington, on duty under the Treasury Department as engineer secretary of the Light-house Board.

Captain Raynolds, stationed at Philadelphia, on duty of construction of light-houses on the Florida reefs and in Delaware bay, under the Treasury Department.

First Lieutenant Wm. F. Smith, stationed at Detroit, Michigan, on duty of construction of light-houses on Lakes Superior, Huron, and Michigan, under the Treasury Department.

First Lieutenant Bryan, in charge of construction of military roads in Kansas, until April 16, 1858, when he was assigned to duty with the army in Utah, from which he was relieved August 14, 1858, and is now under orders to report to Lieutenant Colonel Long, at St. Louis.

First Lieutenant Derlyis, on duty of the construction of light-houses on the coast of the Gulf of Mexico, under the Treasury Department.

First Lieutenant Williamson, on sick leave until April 20, 1858, when

he was assigned to duty at the headquarters of the department of the Pacific. He is also charged with barometric observations, &c.

First Lieutenant Michler, is on duty connected with the survey of a ship canal in the Isthmus of Darien, in addition to which, since August 27, 1858, in charge of parties to run boundary line between Maryland and Virginia. His report is hereto appended marked N.

First Lieutenant Parke, on duty under the State Department as astronomer to the Northwest Boundary commission.

First Lieutenant Warren, in charge of explorations and surveys in Nebraska Territory.

First Lieutenant Mendell has been under the direction of Major Bache, in charge of the military roads in Oregon and Washington Territories. He is now under orders for duty at the Military Academy. His report and that of his assistant Mr. Lacy, will be found appended to the report of Captain Thom.—Appendix L.

First Lieutenant Ives, in charge of exploration and survey of the Rio Colorado of the West.

First Lieutenant Abbott, stationed at Washington, on duty connected with Pacific railroad surveys and since November 16, 1857, assistant to Captain Humphreys, on the Mississippi delta survey.

Second Lieutenant Turnbull, stationed at Detroit, Michigan, assistant to Captain Meade.

Second Lieutenant Wheeler, at headquarters, department of the Pacific, until relieved by First Lieutenant Williamson, then on duty connected with the military roads in Oregon and Washington Territories, as assistant to Captain Thom, now under orders to report to headquarters department of Oregon.

Second Lieutenant Poe, stationed at Detroit, Michigan, assistant to Captain Meade.

Brevet Second Lieutenant J. L. Kirby Smith, stationed at Washington, assistant to Captain Humphreys, until February 12, 1858, then on duty with army in Utah, assistant to Captain Simpson.

Brevet Second Lieutenant Putnam, assistant to Captain Cram, at Troy, New York, until November 26, 1857, then assistant to Captain Humphreys until March 26, 1858, then on duty with the army of Utah, assistant to Captain Simpson.

Brevet Second Lieutenant Wm. Proctor Smith, stationed at Detroit, Michigan, assistant to Captain Meade.

Brevet Second Lieutenant Dixon, assigned as a graduate cadet to the corps in July; is on leave of absence granted by law to graduates of the Military Academy. He is under orders to report to headquarters department of Oregon.

Brevet Second Lieutenant Echels, assigned as a graduate cadet to the corps in July; was on duty at the Military Academy; now on leave of absence granted by law to graduates of the Military Academy; at the expiration of which he is ordered to headquarters of the department of Oregon.

The duties of the corps at the date of its present organization were limited to the extent of country embraced between the Atlantic coast and the frontiers of the States of Mississippi and Arkansas, and be-

tween the northern lakes and the Gulf coast. Within comparatively few years its duties have extended to the coast of the Pacific, in explorations and surveys, in the construction of military roads, and with the army in the several military departments west of the frontier of the old States of the Union. Four of its officers have been during the present year on duty with the army in Utah, four are now under orders to the department of Oregon, and one is at the headquarters of the department of New Mexico, and one at the headquarters of the department of the Pacific. An increase of the corps is necessary to meet the demands of the government for its services, and the recommendation made in previous reports is now renewed. It is also recommended that a company of pioneers be attached to, and officered from the corps, to consist of one hundred enlisted men, including the requisite non-commissioned officers, with the rank, pay, and emoluments allowed by law to the company of sappers and miners. Detachments of the company should be assigned to duty at the headquarters of the several military departments, under the command of an officer or officers of the corps, to aid in reconnaissance and survey and in the construction of military roads, the details for this duty now being taken from the line of the army. A more intelligent class of operators could be thus secured to the government, who, by the instruction of the officers, would soon be competent to act as assistants and computers, and to execute the field drawings and sketches.

The addition to the corps as proposed would be five captains, ten first lieutenants, ten second lieutenants, ten sergeants, ten corporals, two musicians, and thirty-nine privates of the first class and thirty-nine privates of the second class.

The recommendation in previous reports to provide for the preservation and repairs of the steam-dredges is again urged. An appropriation of $20,000 is required for this purpose.

I would invite your attention to the preservation and repair of the works of improvement, harbors and rivers, the balances of former appropriations being almost exhausted.

An appropriation of $600,000 is required, as is also an appropriation of $25,000, for the payment of arrearages.

A brief summary of the operations under the direction of the bureau, with extracts from the reports relating thereto, is presented herewith.

SURVEY OF NORTHERN AND NORTHWESTERN LAKES.

The report is divided into three several heads:

I. *Office work.* II. *Field work.* III. *Estimate.*

Office work.—During the past winter the *personnel* of the survey was employed in the office at Detroit in projecting the field notes of the previous season's work. These comprised seventeen sheets of detailed hydrography and topography, all of Saginaw bay, except

one sheet, which was the final chart of Maumee bay and river. There were included in these sheets 8,850 square inches of drawing. The computations for the final reduction of the base line, for the triangulation, for the latitude and longitude of the astronomical stations, and for the geodetic elements for the projection of the triangulation, all of the Saginaw bay survey, were completed.

In the drawing department, two charts of the St. Mary's river, the chart of Maumee bay and river, and the chart of Agate harbor, Lake Superior, in all four charts, were reduced and transmitted to the engraver for publication. Three charts have been published during the past year, being the harbor of Torras, Lake Huron, and Eagle harbor and Agate harbor, both in Lake Superior. Work has been commenced and good progress made in the charts of Eagle river and Ontonagon, Lake Superior; on the final charts of Saginaw bay, and on the preliminary chart of the Charity islands. There have been issued from the office gratuitously to vessels, on the application of owners and masters, 1,674 copies of the published charts between the dates of October 1, 1857, and September 30, 1858. The rule has been adopted of issuing the charts to the vessel in lieu of the master, for the time being, to insure less frequent reapplication for charts from the same vessel. The demand for charts increases so much, and with it the difficulty of keeping a supply on hand, that the plan is suggested of putting a nominal price on the charts and offering them for sale.

Field operations.—Six parties took the field early in the spring, one for off-shore hydrography, one for triangulation, one for astronomical and magnetic observations, and three for the determination of the topography and hydrography of the four-fathom curve of the shore-line.

These parties were still in the field on September 30, and had accomplished to that date as follows:

The off-shore hydrography of Saginaw bay, of Thunder bay, and of sixty miles of the Lake Huron coast has been completed, the soundings being carried to an average depth of thirty fathoms, and at an average distance of nine miles from shore. The triangulation has been extended over Saginaw bay, Thunder bay, and between this last and Presque Isle. The latitude, longitude, and magnetic elements of declination, dip, and intensity have been determined at four stations in Lake Huron. The topography and hydrography to the four-fathom curve of the shore-line of Lake Huron have been obtained for a space of one hundred and seventy-seven miles; in other words, the data obtained for the final chart of Saginaw bay, the preliminary charts of Thunder bay, and of the harbors of Presque Isle and Middle island, Lake Huron, and nearly all the data required for the final chart of the Lake Huron coast within the limits of the United States.

Estimate.—In the estimate for future operations it is proposed to complete the survey of Lake Huron, already so far advanced, and to place that portion of the existing force not required for this purpose in Lake Superior. To carry out this project will require $100,371 15, an amount a little larger than the appropriation for the current fiscal

year, due to the fact that operations must of necessity be carried on in two lakes simultaneously. Attention is called to the urgent necessity of extending the survey of the north end of Lake Michigan, to include the Fox and Manitou islands, together with Green bay and its approaches, and the sum of $50,000 is asked for this purpose, if it should be the will of Congress to authorize this work.

Considerations are advanced the purport of which is to demonstrate that economy and a true regard to the public interests would dictate larger appropriations, which would authorize the expansion of the present work to proportions more commensurate with its real importance, and would enable results to be produced more rapidly, and thus satisfy the eager and constant demand for information.

Survey of the delta of the Mississippi.—The engineer in charge of this work, Captain Humphreys, resumed its active prosecution during the last fall. Gauge rods were established at prominent points; measurements and soundings of the high water cross sections made; corresponding measurements of velocities made; measuring dimensions of crevasses and collecting information thereof, &c., also occupied his attention; chain and level surveys made, and profiles of railroad routes crossing the overflowed lands obtained.

The following extract from his report will be read with interest:

"The resumption of field work at this time has been singularly fortunate. The flood of this year is the first which has occurred since the field work of the survey in 1851, and observations like those undertaken this year would have been of comparatively little value before this season. The parties were all organized, the river gauges erected, &c., &c., before the river began to rise last winter, and all the phenomena of the high water of this year have been accurately observed in a manner which, together with the results of other information collected, and with the results of former examinations, investigations, and surveys, cannot fail to supply the data required to solve the problems, which can only be solved by investigations as extended and elaborate as those enumerated."

Improvement of Red river at and near the Raft.—The unexpended balance of the last appropriation has been mostly applied in cutting and removing newly formed raft from the main river a little above the outlet into Dutch John's lake; the lake being now converted into a capacious receptacle for the logs, &c., removed from the raft above its head.

Fresh accumulations of drift, however, have been contributed to prolong the raft upward in the main river more rapidly than the small force were able to reduce its extent by their efforts applied at the foot of this portion of the raft.

The drift wood likely to be brought down by the ensuing high freshets will probably prolong the raft upwards, even beyond the head of Red bayou, the only channel now practicable between lower and upper Red river; a result which will prove detrimental to the commerce of the Red river country, both in a civil and military point of view. In submitting an estimate for five consecutive years the superintending engineer remarks:

"I have every reason to believe that the navigation of Red river cannot be kept clear of obstructions otherwise than by annual efforts at removing the rafts, which are continually liable to be enlarged and renewed by annual accumulations of drift wood; and am also persuaded that the sums proposed to be appropriated, as above, will be sufficient to keep the river open and navigable for steamers of light draught during the period above contemplated. I am, moreover, persuaded that a manifold remuneration would accrue to the benefit, not only of the river commerce, but to that of the country at large, from the proposed outlay in the way of appropriations by Congress."

Of the removal of obstructions from the mouths of the Mississippi.—Two distinct contracts were made, one for the removal of obstructions from the Southwest pass, the other for the removal of obstructions at Pass l'Outre. Each contract provided: first, for the opening the channel in each pass; and second, for keeping open the channel in each pass during a period of four and one-half years, from and after the dates at which the channels in the respective passes shall have been opened.

Unavoidable delays and insurmountable difficulties induced the contractors to apply for extension of time for fulfilling the first branches of their contracts, which was granted by the department.

The superintending engineer remarks:

"The indulgence granted in this case was accompanied by another of equal propriety and necessity, which admitted of a reduction of the depth of the channels to be opened from twenty to eighteen feet, owing to the obvious inadequacy of the means appropriated to open channels of a greater depth than that last mentioned."

The channel at the Southwest pass was opened across the tidal bar in May last, and that at Pass à l'Outre in September. Both channels are easy of navigation for vessels drawing not more than eighteen feet.

A further appropriation of $13,177 95 will be required for defraying the expenses likely to be incurred in the supervision, inspection, &c., of the work remaining to be done, under the contracts for the removal of obstructions from the mouths of the Mississippi during a period of four and one-half years from the date of opening the channel.

For the details of the estimate and the necessity therefor, I beg leave to refer you to the report of Colonel Long, hereto appended, marked "B."

Of disbursements and settlements on account of western rivers at large.—The expenditures for the year have amounted to $2,165 01. The unexpended balance is $4,098 26, which will be applied to the liquidation of incidental expenses accruing from time to time on account of the duties relating to the improvement of western rivers at large.

Improvement of the Ohio river, including Cumberland dam.—The work done under this appropriation within the last fiscal year consists merely in the blasting of rocks in the Indiana chute or channel at the Falls of the Ohio, which exhausted the entire balance of the appropriation.

Improvement of the Mississippi, Missouri, and Arkansas rivers.—Nothing having been done during the last fiscal year, no expenditures have been incurred.

The balances remaining on hand were, by direction of the bureau, transferred to Captain Abert, with the view of finally adjusting and settling the matters pertaining to these rivers.

For the further prosecution of the work on the western rivers, &c., during a period of five years from and after June 30, 1859, the superintending engineer presents the following summary estimates:

Object for which appropriations are wanted.	Cost of craft and working same for 1st year.	Annual cost of working craft for 2d, 3d, 4th and 5th years.
Improvement of Mississippi river	$172,900	$92,400
Improvement of Missouri river	94,600	59,100
Improvement of Arkansas river	58,900	38,400
Improvement of Red river	110,350	52,350
Improvement of Ohio river	71,700	38,700
Improvement of Illinois river	24,800	9,300
Supervision, inspection, &c, of the works at the mouths of the Mississippi river, for a term of 4½ years	13,178	.....

Improvement of Des Moines Rapids of the Mississippi river.—The operations have been seriously retarded by the continued stage of high water, which is now about four feet above low water and rising, with no prospect of low water this season. Until the 27th of June, 1858, the work was prosecuted by hired labor, but on that date a contract, after thirty days public notice, was entered into with J. C. Osgood, of Troy, New York, the lowest bidder.

The agent remarks: "I confess that I am not entirely satisfied with the work of the steam chisels. They are effective, but do not cut as rapidly as I had been led to believe. It is, however, proper to say that *no work whatever* could have been done this season, on account of the high water, by drilling and blasting."

Expenditures during the year ending June 30, 1858 .... $47,370 90
Amount required next year ....
Amount required to complete the work, according to plan 700,000 00
Extent of navigation to be benefitted, from St. Paul to New Orleans ..... 2,000 miles.

Improvement of Rock Island Rapids of the Mississippi river.—There being no appropriation applicable to this improvement, no work has been done during the last year.

Amount necessary to complete the work, according to plan $500,000 00
Amount which might be judiciously expended next year 50,000 00

Deepening channel over the St. Clair Flats.—At the date of the last annual report a cut from forty to forty-five feet wide, and about four-

teen feet in depth, had been excavated entirely through the flats, from the river channel to the deep water of the lake. The dredging has since progressed until the remnant of the appropriation was nearly exhausted. A survey of the excavated channel has been made, and a map of the result exhibits also the sites of the light-house and beacon now in process of erection as aids to the navigation of this channel. The printing of this map for immediate distribution is strongly urged. The excavated channel is, at the upper end of the cut, the narrowest part, 200 feet in width between the 12 feet curves. At the lower (or the lake end) it is 275 feet, which is almost the average width throughout. The average width between the 13 feet curves is about 230 feet, with depth from 14 to 15½ feet. The officer in charge remarks: "In conformity with your instructions I have endeavored to form a complete channel through the St. Clair Flats, and to render it as perfect as the means placed at my disposal by the appropriation would allow. This I claim to have accomplished, and if I am correctly informed all the lake navigators are gratified at the result." The channel's capacity, in point of depth, was limited by the amount of the appropriation. To meet the exigency of low water in succeeding years it is recommended that a deep cut through the new channel, 150 feet in width, be made, for which the engineer in charge submits an estimate of $50,000. I beg to call your attention to the report of Captain Whipple, herewith appended, for the highly interesting facts pertaining to the rise and fall of the waters of the lakes therein presented.

For building foundations for a light-house and beacon on St. Clair Flats.—The plans submitted for these structures were approved by the bureau on the 15th of June last. The materials were immediately sought for. The piles forming the two clusters to support the light-house and beacon have been driven; the cribs to surround the piles have been constructed and sunk in their position in seven and eight feet water respectively, and rise seven feet above the surface of the lake.

The concrete used in the foundations is made of Rosendale cement; the iron girders and beams are in the process of construction. The operations have been much retarded by stormy weather. The present appropriation will complete these works, unless unforeseen difficulties should be experienced.

For deepening the channel of St. Mary's river.—Since the last annual report a most important change has been effected, upon the recommendation of Captain A. W. Whipple, the engineer in charge, by the substitution of a new channel for that originally adopted. A board of engineers was appointed by the Secretary of War to report which of the three channels through the flats of Lake George was the most favorable for improvement. The board recommended the middle channel. A joint resolution of Congress authorized the Secretary of War to cause the appropriation to be expended on such channel as he deemed best. Accordingly the Secretary of War approved the change suggested by Captain Whipple and recommended by the board of engineers.

"Meanwhile, there being no authority to suspend the work, the dredging of the west channel was carried on at a great sacrifice of the appropriation, until June 12, 1858." * * * * * "On the 14th June the dredging was commenced in the middle channel, which by my direction had been previously surveyed and marked out for the purpose; and since that date the operation of improving this passage has progressed in the most satisfactory manner. The difficulties encountered in excavating through the middle passage have been slight, in comparison to those experienced in the west channel, as will appear by a reference to the report and daily record of the work."

"The channel excavated through the flats is nearly one hundred feet wide, from the top of the slopes, and seventy-five feet in width at the bottom, with depths varying from 14 to 15 feet. This gratifying result has been produced since the 14th of June."

At the close of the season it is believed that the excavated channel will be 120 feet in width. To complete the channel, with a width of 300 feet and a depth of 14 feet, further appropriations will be needed. At the East Neebish rapids, a channel has been excavated eighty feet in width, and from 14 to 18 feet in depth. A chart of this improvement accompanies the report, which should be printed for distribution to navigators of the lakes.

The engineer in charge recommends the deepening of the centre of the Neebish channel, 50 feet in width to the depth of 17 feet, to meet the depression of water in succeeding years. The estimates for completing the separate portions of this improvement require an additional appropriation of $77,546.

I invite your special attention to the report and estimates of Captain Whipple, hereto appended, (marked "H.")

MILITARY ROADS IN MINNESOTA.

I. *Military road from Point Douglass to the mouth of St. Louis river.*—This road has been worked to the 121st mile. There remains to be opened 57 miles, for which appropriations of funds are required. The increased high water of the present season has shown that a revision of the previous estimate is needed. An increase of about $6,000 makes the present estimate $50,000.

The importance of this road is derived from the fact that it is the only road connecting the head of navigation on the Mississippi with Lake Superior.

II. *Military road from Fort Ripley, via Crow Wing river, to the main road leading to the Red River of the North.*—The route for this road was surveyed in 1857; a special report and map of which was submitted by Captain Thom. Congress failed to appropriate at its last session. A portion of the "first section," a distance of 37½ miles, has been opened. On the first 29 miles from Fort Ripley the streams are all bridged, excepting the Mississippi at Crow Wing village, where there is a good ferry, and at Gull river, where a bridge is essential. The estimate for continuing the road has also undergone

a revision, based upon more accurate information, as to prices for labor and materials, and is increased to $32,800.

A branch, or rather an extension of this road is deemed highly necessary, inasmuch as the newly established military post should have easy communication with Fort Ripley. The length of the proposed extension will be sixty to sixty-five miles, for which an estimate of $41,100 is presented. In addition to this is presented an estimate for bridges across the Mississippi and the Crow Wing, and for trestle work, $19,100.

III. *Military road from Mendota to the mouth of Big Sioux river.*—The entire length of this road according to the original survey (1853) is 279 miles The route was re-surveyed by Captain Thom as far as the 178th mile, (measured from the mouth of the Big Sioux,) a distance of 101 miles, and constructed (owing to the small amount appropriated) in a manner only to make that portion of the road barely practicable, by the construction of such bridges, culverts, corduroying, &c., as were most necessary. As the county road has become opened by settlement, it is shown that a still better and shorter route can be obtained between the point where the construction terminates and the mouth of the Big Sioux, than that followed by the original exploration. The estimate for surveys and construction is $39,700. For details of these roads, see report of Captain Stansbury, who succeeded Captain Thom, as engineer in charge, in June last.—(See Appendix D.)

Military road from Fort Riley to Bridger's Pass, Kansas Territory.—The unexpended balance of this appropriation is being applied to the construction of bridges and working the portion of the road between Fort Riley and Fort Kearney, all of which is under contract.—The road is now in good travelling condition for fifty miles above Fort Riley, as it will be to Fort Kearney, on the completion of the contract work, or by the first of December next.

The engineer in charge of construction, suggests the opening of a route from Fort Riley to Utah, crossing the Republican Fork of the Kansas River at or near Fort Riley; thence following the dividing ridge between the forks of the Kansas river, by such route westward as shall be shortest and most feasible for travel, and thence to the most practicable pass in the Rocky mountains.

Military road in Nebraska Territory, from a point on the Missouri river (Omaha) opposite Council Bluffs City, to New Fort Kearney.—The bridges and embankments under contract at the period of rendering the last annual report, have been completed. Many small bridges have been built and other work done by hired labor and purchased materials. All the bridges on the road have withstood the heavy freshets of the present year, whilst most of those in Kansas and Nebraska, and many in Iowa and Missouri, have been washed away. The road is now, with the exception of the Loup Fork, a good wagon road for all the dry season of the year. A bridge at Loup Fork, and small bridges, corduroy crossings, culverts, ditches, embank-

ments &c., &c., are now necessary to complete the road and make it practicable at all seasons; for which the estimate of $108,500, presented in the last annual report, is renewed. The importance of this road in a civil and military point of view, is clearly exhibited by Captain Beckwith, U. S. A., the engineer in charge, in his report herewith appended, marked "M."

MILITARY ROADS IN NEW MEXICO.

I. *From Fort Union to Santa Fé.*
II. *From Secalote to Albuquerque.*
III. *From Cañada to Abequea.*
IV. *From Taos to Santa Fé.*
V. *From Santa Fé to Doña Ana.*

I. *Road from Fort Union to Santa Fé.*—The amount of labor bestowed upon this road is 10,499½ days' work of foreman, mechanics, and laborers, and 131 days' use of teams; the result of which has been to overcome two of the most formidable obstacles upon the route, namely, the rocky hill near Secalote, and the rough and dangerous route through the Apache Cañon. The above is all in use, having been thrown open as successive portions of it were completed. Between "Rock Corrall" and Apache Cañon, a large amount of work has been applied to the new route across a mountain spur, and it is hoped that the balance of the appropriation will open this section for travel. A portion of it has been in use for three months. This road affords the communication between Fort Union and the headquarters of the military department of New Mexico, and is also used as the best route at present between Fort Union and the principal depot at Albuqerque. It is a portion of the great mail route between the old States of the Union and the largest settlements of New Mexico; it is in short the principal entrance to the heart of this Territory. The estimate for completing this road is $35,000, for the details of which see Appendix "F".

II. *Road from Secalote to Albuquerque.*—The labor expended upon this road is 1,479½ days' work of foreman, mechanics and laborers, and 124 days' use of teams; the result of which is a new road which affords an easier descent from the mouth of the cañon Carnuel to the Albuquerque plain, and within the cañon many of the difficulties have been removed, and the road rendered comparatively safe. Still much remains to be done to make a good and permanent road through the cañon. It is necessary to pass through this cañon in the route between Albuquerque and Fort Stanton, and in getting the supplies of timber and fuel for the new depot at Albuquerque. The two cañons, Carnuel and Blanco, in this road, required the first attention, which will probably exhaust the amount of appropriation—$10,000. There is another point of great difficulty which should be improved to afford an easier route between the eastern borders of the Territory and the military depot at Albuquerque.

The amount yet required to complete the road is $23,000. For the details of the estimate, see Appendix "F."

III. *Road from Cañada to Abequea.*—The labor bestowed upon this road is 1,138 days' work of foreman, mechanics, and laborers, and 13 days' use of teams. "This road derives its military importance from the fact that Abequea formerly was garrisoned by our troops, and is likely to be again occupied, as it is one of the avenues by which to enter the Navajo country. A certain degree of importance and interest must also be attached to it as the eastern terminus of the 'old Spanish trail.'"

IV. *Road from Taos to Santa Fé.*—"This road is of very great interest and importance, whether considered in a commercial or military light, as the means of affording an easy outlet for the abundant products of the rich and justly celebrated valley of Taos, or as the route of communication between the headquarters of the department and the upper posts of the valley of the Rio del Norte."

The road now used presents many difficulties, being very circuitous and rough.

After careful examination of the several routes, the engineer in charge recommends for improvement the route from Taos, *via* "Sienaguilla;" thence through the cañon of the Rio del Norte to La Joza; and thence by the road common to all the routes, to Santa Fé; being in all 73 miles, and 14 miles shorter than the present road. The amount of appropriation required to complete this important work is $113,000. For details of estimate, see Appendix "F."

V. *Road from Santa Fé to Doña Ana.*—This route constitutes the line of communication between the headquarters of the department at Santa Fé and the military posts down the Rio del Norte, and also, in part, between these posts and those east and west of that river, in New Mexico.

The sum of $12,000 originally appropriated for this long road of some 300 miles, was entirely too small. The small balance that came into the hands of the engineer in charge has been applied to that section of the road between Santa Fé and Albuquerque, and a party has been at work upon the descent into the valley of the Galisteo. For the completion of this road, including survey for location, between Albuquerque and Doña Ana, the sum of $25,000 is required.

For detailed information of the military roads in the department of New Mexico, I ask your attention to the report and estimates of Captain Macomb.—(Appendix "F.")

MILITARY ROADS IN SOUTHERN OREGON.

I. *Road from Camp Stewart to Myrtle creek.*—The length of this road is about ninety-five miles, the more difficult portions of which have been mostly worked by hired labor. The bridges and certain portions of the road that would have been difficult to supervise, have

been done by contracts, viz.: repairs, &c., of thirteen miles, and construction of three bridges of lengths of seventy-five feet, one hundred and fifty feet, and one hundred and thirty feet respectively, and agreements have been entered into for the erection of other small bridges. The character of the road that has been opened permanently is sixteen feet in width, free from roots and stumps, the timber cut down to widths of thirty and sixty feet. The width is reduced where there is heavy earth or rock excavation, but in all places it will be easily practicable for a six mule team. The engineer in charge, Lieutenant Mendell, reports: "An additional amount of $10,000 is very much needed to complete, on the same scale, the whole line. Immediately north of the cañon there is an interval of two miles where high cliffs abut against the stream, and which, in high water, is impassable. This corrected, the main route to California will be a most excellent road. If it is not built by the government, it is probable that it will remain in its present state for many years to come."

II. *Road from Scottsburg to Myrtle creek.*—This road is a continuation of the road from Camp Stewart to Myrtle creek. It is about sixty-five miles in length. Laboring parties have been employed in the general repair of the road, and in the construction of bridges of a substantial character. Contracts have been made—

1. For the construction of several bridges, the aggregate length of which is 316 feet;

2. For the repair of the bridge over Deer creek at Roseburg, of 175 feet in length; and

3. For the construction of a bridge over the Kansas swale, 220 feet in length.

"It has been the aim on these roads to make the improvements of the most permanent character, and to improve those points which the sparse population would have been unable to accomplish for years to come."

MILITARY ROAD FROM SALEM TO ASTORIA, OREGON TERRITORY.

At the date of the last annual report there remained unopened sixteen miles of this road. This was completed in October last. Further examination of the country to improve the location of the road is suggested, before applying the appropriation made at the last session of Congress.

MILITARY ROADS IN WASHINGTON TERRITORY.

I. *Vancouver and Steilacoom Military road.*—Since the last report thirty-three miles of this road, lying between Fort Steilacoom and Cowlitz Plains, have been made by contract and accepted. The location of the road was continued down the west bank of the Cowlitz to Monticello, seventeen miles of which have been put under contract, which, when completed, will exhaust the funds on hand. There remains eleven miles above Monticello untouched, for which an addi-

tional appropriation of $10,000 is required. To open the line from the Cowlitz river to Vancouver an appropriation of $40,000 is required, making in all $50,000 for the completion of this road, the military importance of which has been urged in former reports.

II. *Steilacoom and Bellingham Bay Military road.*—The reconnaissance of this road was completed in November last, and the maps and memoir have been prepared. There have been completed by contracts nearly twenty-seven miles of the road and several hundred feet of bridges.

The portions worked lie between Puyallup river and Seattle, about twenty and one-fourth miles; and at Bellingham bay, five and a half miles. A bid for a trail from Seattle to Whatcom was made, but the balance on hand not being sufficient to open the line throughout, it was rejected. An additional appropriation of $40,000 will be necessary.

Captain Thom, recently assigned to the charge of the military roads in Oregon and Washington, presents the following exhibit of the funds pertaining to the several roads, and the amounts estimated for their completion:

	Amount of funds on hand.	Amount required to complete.
1. Myrtle creek to Camp Stowart	$15,653 22	$10,000 00
2. Myrtle creek to Scottsburg	19,302 40	----------
3. Astoria to Salem	31,988 50	----------
4. Vancouver to Dalles	34 73	----------
5. Vancouver to Steilacoom	4,575 53	50,000 00
6. Bellingham bay to Steilacoom	8,534 12	40,000 00

In addition to the above roads, reports have been made by this bureau, during the past year, in relation to the construction of certain roads, and submitting estimates therefor:

1. Fort Steilacoom to Fort Walla-Walla $25,000
2. Fort Vancouver to Fort Dalles, O. T 25,000
3. Mouth of Columbia River, *via* Shoal Water bay and Gregg's harbor, to Olympia 70,000
4. Olympia to Port Townsend 50,000
5. Seattle to Fort Colville 50,000

Inasmuch as this Territory is the field of active hostilities with several Indian tribes, it is deemed proper to advert to these reports at this time, and to renew the recommendations therein made.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Topographical Engineers.

Hon. JOHN B. FLOYD,
Secretary of War.

APPENDIX A.

WASHINGTON, *October* 20, 1858.

SIR: Since my annual report of last year my attention has been directed mainly to the question of a chart of Lake Ontario, conformably with the indications of your letter of the 24th of June, and 21st of July, 1857. Owing, however, to the very limited amount of money assigned to the work, but little has been accomplished with reference to it.

It has been suggested that Ford's chart of Lake Ontario might be used in connexion with other materials in the composition of a new chart. I would, however, very respectfully state that a close and careful examination of Ford's charts, and a comparion of the two editions (1836--1856) which have been in my hands, have not inspired me with confidence in either of them as the basis of a chart to which the bureau could give its sanction, or whose accuracy and sufficiency for the purposes of navigation the bureau could conscientiously certify. Such charts could only serve us as preliminary sketches or guides for the field work during the progress of the actual survey. Moreover, I have found in the bureau or elsewhere but scant, in fact scarcely any materials that we could be warranted in using for the details of a work purporting to be a safe and sufficient guide for navigators. In my last annual report I took occasion to offer some suggestions respecting this survey, and I proposed a further appropriation of means for carrying those suggestions into execution. Until such suggestions are carried out, the navigators of Lake Ontario will have reason to complain, it seems to me, that the government furnishes gratuitously for the upper lakes, charts of unquestionable accuracy and in the fullest detail, as it furnishes also at a merely nominal price the charts which it executes for the Atlantic and Pacific coasts, while, on the contrary, the supply of charts for Lake Ontario is in private hands, and want the requisite authenticity. Being a monopoly, their price to the navigator is regulated by the will of the holder of the copyright in them, and he charges three dollars per copy for them, which is certainly a very liberal price. Whatever the intrinsic value of those charts, their distribution, which depends upon their price and the estimation in which they are held, is very limited. It would seem probable, from a comparison of dates, that they do not exhaust an edition in twenty years or thereabouts, and this is clearly very much below the wants of navigators, if we may judge from the eager demand for the charts of the upper lakes, executed by the government.

In conclusion, I have respectfully to refer you to my annual report of last year, and to renew the estimate which will be found in it.

I have the honor to be, sir, your obedient servant,

JAMES KEARNEY,
Lieutenant Colonel Topographical Engineers.

Colonel J. J. ABERT,
Bureau Topographical Engineers.

APPENDIX B.

Annual report of Lieutenant Colonel S. H. Long.

UNITED STATES TOPOGRAPHICAL OFFICE,
St. Louis, October 15, 1858.

SIR: In accordance with paragraph 1224 of the new army regulations, it becomes my duty to submit an annual report of my official proceedings for the fiscal year ending on the 30th day of June, 1858, in season to reach the Topographical Bureau on or before the 20th instant, and I now take occasion to comply with the duty thus enjoined.

The services to which my attention has been directed during the year relate, first, to the improvement of Red river at and near the raft; second, to the removal of obstructions from the mouths of the Mississippi; third, to the construction of a road from Fort Riley to Fort Kearney, being a portion of the road from the same point to Bridger's Pass in the Rocky mountains; fourth, to disbursements and settlements on account of western rivers at large; fifth, to the improvement of the Ohio river, including Cumberland dam; and sixth, to the improvement of the Mississippi, Missouri, and Arkansas rivers.

The proceedings under these several heads, including the services rendered, and the receipts and expenditures incurred in the prosecution thereof, will be considered in the order of their enumeration as above, to wit:

1. *Of the improvement of Red river at and near the Raft—C. A. Fuller, agent.*

The funds applicable to the prosecution of this improvement, on the 1st of July, 1857, consisted of an unexpended balance of		$13,040 13
The expenditures incurred in the prosecution of the work during the year ending on the 30th of June last, were as follows, viz:		
For the third quarter of 1857	$2,818 58	
For the fourth quarter of 1857	3,425 68	
For the first quarter of 1858	2,598 43	
For the second quarter of 1858	2,248 07	
Amount expended during the year		11,090 76
Unexpended balance on hand July 1, 1858		1,949 37

At the date last mentioned, sundry outstanding accounts for articles furnished and services rendered remained to be paid, besides which various other expenditures must unavoidably be incurred in winding

up the affairs of the week and in making a proper disposition of the boats and other apparatus that had been applied to its prosecution.

Agreeably to the returns of Agent Fuller, the receipts and expenditures incurred in this way are as follows, viz:

Balance on hand as above, July 1, 1858	$1,949 37
Net proceeds from sale of public property	2,615 86
Amount of receipts	4,565 23
Expenditures incurred in the adjustment of outstanding accounts and in arrangements for the sale of the public property, &c., within the third quarter of 1858	2,723 62
Uunexpended balance	1,841 61

Hence, it is apparent that a portion of the proceeds arising from the sale has been applied in the payment of expenditures incurred under the appropriation proper, while the residue has been duly transferred to me and placed, as usual, to the credit of the fund for the "improvement of western rivers at large."

Having duly considered the work in its fiscal relations, other considerations now claim attention.

For numerous details in reference to the condition of this work, and to the progress made towards its accomplishment prior to the close of 1857, I take leave to refer to my "Inspection Report" of January last, a copy of which is hereto appended.—(See Appendix, document No. 1.)

In reference to the discovery of a new channel for navigation, as contemplated in my instructions to Agent Fuller, dated on the 3d of December last, and included in my inspection report above cited, (see Appendix, document No. 1,) subsequent examinations and inquiries have shown conclusively that no such channel can be found. The amended sketch of the Raft district, accompanying this report, seems to corroborate and verify the conclusions arrived at as above.

At the time of the inspection the stage of the river (Red river) was elevated considerably above ordinary low water, and agreeably to repeated representations subsequently made to Agent Fuller, it continued to fluctuate between that and very high stages till about the middle of June following.

In the meantime, and with a force varying from twelve to fourteen or fifteen hands only, the work was prosecuted with all practicable diligence, the force being employed for the most part in cutting and removing newly formed raft from the main river, a little above the outlet into Dutch John lake, which latter was now converted into a capacious receptacle for the logs, &c., removed from the raft above its head. But the fresh accumulations brought down by successive freshets, contributed to prolong the raft upward in the main river more rapidly than the forces were able to reduce its extent by their efforts applied at the foot of this portion of the raft. Hence the head

of the raft has advanced upward, till at length it has reached a point only about one-fourth of a mile below the head of or outlet into Red Bayou, the only channel now practicable for navigation between Red river below and Red river above the raft, or between lower and upper Red river. The drift wood likely to be brought down by the next ensuing high freshet will probably be sufficient to prolong the raft upward even beyond the head of the Red Bayou, when the catastrophe just adverted to will have taken place, and the commerce of the Red river country, both in a civil and military point of view, will suffer detriment to a vast and incalculable amount.

On finding that the old appropriation for the improvement of Red river at and near the raft was nearly exhausted, and that no new appropriation had been made by Congress at their late session, I addressed a letter to the Topographical Bureau on the 19th of June last, of which a copy is herewith appended.—(See Appx., Doc. No. 2.)

In conformity to the suggestions contained in the letter just referred to, and with the approval of the War Department, Agent Fuller was directed to suspend operations on the work under his charge, and to make sale of the boats, their equipments, and other public property, of all sorts, employed in the prosecution of said work.

The proceedings of the agent under these directions, and all proper details in reference to the disposition and sale of the public property mentioned, are exhibited in his last report relating to the improvement of Red river, a copy of which is hereto appended.—(See Appendix, Doc. No. 3.)

With regard to an estimate for the further prosecution of this improvement, Agent Fuller has submitted his views in the document last cited as above. My views on this subject differ in some respects from those of the agent. Instead of the latter, I would recommend annual appropriations for a period of five consecutive years. With this view, I would suggest an estimate similar to that contained in the sequel of my inspection report first above cited, (see Appendix, Doc. No. 1,) with considerable additions to compensate for the public property recently disposed of by the agent.

The proposed estimate is as follows:

Estimate for the improvement of Red river at and near the raft for five consecutive years, beginning July 1, 1859, and ending June 30, 1864.

Probable cost of water craft, including a new snag boat, a new machine boat, and a new dredge boat, with equipments complete for the whole	$58,000 00
Annual cost of working and of preserving the same, $52,350. Cost of working and preserving the same during five consecutive years	261,750 00
Total cost of craft and working same for five years	319,750 00

The above amount is proposed to be applied annually, as follows, viz:

For the first year, covering cost of new craft, equipments, &c., and working and preserving same.....	$110,350 00
For the second, third, fourth, and fifth years, respectively, at $52,350 per year, or for four years.....	209,400 00
Amount as before.....	319,750 00

From the representations of Agent Fuller, and from my own observations, I have every reason to believe that the navigation of Red river cannot be kept clear of obstructions otherwise than by annual efforts at removing the rafts which are continually liable to be renewed and enlarged by annual accumulations of drift wood; and am also persuaded that the sums proposed to be appropriated as above will be sufficient to keep the river open and navigable for steamers of light draught during the period above contemplated. I am, moreover, persuaded that a manifold remuneration would accrue to the benefit not only of the river commerce, but to that of the country at large, from the proposed outlay in the way of appropriations by Congress.

2. *Of the removal of obstructions from the mouths of the Mississippi, in part—Lieutenant Colonel Long, agent.*

The removal of obstructions from the mouths of the Mississippi river, as stipulated to be done by Messrs. Craig and Righter, was provided for by two distinct contracts, viz: one for the removal of obstructions from the Southwest Pass, and the other for the removal of obstructions from Pass à l'Outre, both dated on the 13th of September, 1856. Each of these contracts embraced two distinct objects, viz: the first for *opening* the channel in each pass, and the second for *keeping open* the channel in each pass, during a period of four and a half years, from and after the dates at which the channels of the respective passes shall have been opened.

The work under the contract for the Southwest Pass was commenced early in the spring of 1857, while that for the improvement of Pass à l'Outre was not commenced till about a year thereafter. The progress of the work in the former was obstructed by numerous unforeseen difficulties and hindrances which no doubt contributed to prevent, and even render impracticable, the earlier commencement of the work in the latter.

In consequence of the unavoidable delays alluded to, and of subsequent insurmountable difficulties, the contractors were induced to apply for three successive indulgencies by extensions of the times of fulfilling the first objects or branches of their contracts, viz: the opening of the channels, which have been generously accorded to the following extent, viz: 1. An extension of both contracts to the 1st of January, 1858; 2. A similar extension to the 1st of July, 1858; and 3. An extension of the contract for Pass à l'Outre to the 1st of July, 1859.

From these premises I proceed under this head in the manner first intended, as follows:

Unexpended balance of the amount drawn by me on account of supervision and inspections of the work done under the contracts prior to the 1st of July, 1857		$1,117 85
Amount drawn as before, within the fiscal year ending on the 30th of June, 1858		3,500 00
Total receipts for the year		4,617 85

Expenditures.

For the third quarter of 1857	$794 48	
For the fourth quarter of 1857	1,008 52	
For the first quarter of 1858	428 00	
For the second quarter of 1858	1,027 40	
Amount expended during the year		3,258 40
Unexpended balance July 1, 1858		1,359 45

I take occasion in this place to remark, that the amount of the original appropriation for the removal of obstructions from the mouths of the Mississippi was $330,000; that of this amount $250,000 was made applicable, agreeably to the contract, to the *opening* of the channels of the Southwest Pass and Pass à l'Outre, across the tidal bars at the mouths of these passes; that $72,000 was made applicable to the *keeping open* of the said channels during a term of four and a half years from the date of their being opened; and that the residue of the appropriation, viz: $8.000, was probably reserved to defray the expenses of supervision, inspection, &c., of the works to be done under the contracts.

Of this last mentioned sum ($8,000,) $3,258 40, as above stated, had been expended prior to the 1st of July last, since which $714 55 have also been expended on account of supervision, inspection, &c,; making the whole amount of expenditures on these accounts, prior to the date of this report, $3,972 95. This sum deducted from the supposed reservation as above, will leave a balance of $4,027 05, a sum obviously far too small to defray the expenses incident to the supervision, &c., during the protracted period of four and a half years, as contemplated in the contracts.

Accordingly I take leave to subjoin the following estimate, with a view to a new appropriation for defraying the expenses just considered, viz:

Estimate of expenses likely to be incurred in the supervision, inspection, &c., of the work remaining to be done under the contracts for the removal of obstructions from the mouths of the Mississippi.

Pay of supervisor 4½ years, at $2,190 per year	$10,855 00
Pay of two boatmen, with skiff, oars, and sails complete, in service half the time, viz: 2¼ years, at $1,460	3,650 00
Allowances for transportation and other contingencies, 4½ years, at $600 per year	2,700 00
Amounting to	17,205 00
Deduct balance of reserve, as above	4,027 05
Proposed amount of new appropriation, as above	13,177 95

The proceedings had under this head embrace sundry examinations, inspections, triangulations, soundings, &c., partially made prior to the beginning of the fiscal year, but for the most part accomplished within said year.

An adequate account of these proceedings, up to the close of 1857, is exhibited in my inspection report of December 31 of that year, a copy of which is hereto appended.—(See Appendix, document No. 4.)

The contractors anticipating their inability to accomplish the first objects of their contracts—viz: the *opening* of the channels within the limit of the first extension granted—seasonably applied for a renewed extension to July 1, 1858, which, for good and sufficient reasons urged in favor of the extension solicited, was granted by the War Department, under date of January 4, 1858, as before observed. A copy of their application and of my report thereon is contained in Appendix No. 4, before cited.

The indulgence granted in this case was accompanied by another of equal propriety and necessity, which admitted of a reduction of the depth of the channels to be opened from twenty to eighteen feet, owing to the obvious inadequacy of the means appropriated to open channels of a greater depth than that last mentioned. Most of the reasons in favor of this last modificaton of the contracts have already been exhibited in the report before referred to.—(See Appendix, document No. 4.)

A report from the supervisor, Wm. Johnson, dated December 10, 1858, exhibits numerous details explanatory of the progress of the work at the Southwest Pass, and of his surveys, soundings, and other services rendered by him during the preceding summer and fall. To this report I take leave to refer for much valuable information on the subjects mentioned.—(See Appendix, document No. 4, before cited.)

During the winter of 1857–'58 the contractors made arrangements for the introduction of a powerful tug-boat, armed with scrapers, harrows, &c., and furnished with torpedoes charged with 50 to 200 pounds of powder each, together with suitable apparatus for igniting

ɔ charges at the bottom of the passes—all for the purpose of ascer-
ning the most feasible method of opening the channels, and adopt-
; the same in aid of the further prosecution of the work of the
ıtracts.

The utility of these appliances and the benefits already derived
ɜrefrom have been sufficiently explained in my inspection report of
ıy 31, 1858.—(See Appendix, document No. 5.)

The report above cited, especially in so far as it relates to the
al inspection and acceptance of the work done under the first branch
the modified contract for the removal of obstructions from the
ıuth of the Southwest Pass, has been accepted by the War Depart-
ınt, and I am informed that due payment has been made on account
ɜreof to the contractors by the same department.

On the date last mentioned, (May 31, 1858,) Messrs. Craig & Righter
plied for another extension of the time allowed for the fulfillment
their contract for Pass à l'Outre—viz: the *opening* of the channel in
.s pass—alleging that "all their energies having been directed to
ɜ opening of the Southwest Pass, they had not progressed with the
ırk at Pass à l'Outre as they had confidently expected." For this
d various other reasons touching the economy of the work and the
iciency of their new mode of operation, and especially in view of the
:er impracticability of accomplishing the first object of their con-
.ct within the extended period previously allowed for its fulfillment,
ook occasion to commend their application to the favorable consid-
ıtion of the War Department.

Their application was favorably received at the department, and
ɜ period of fulfillment, as above, was extended to July 1, 1859.

From the 28th of May till an early date in August following, very
:le was done in either of the passes towards the fulfillment of the
ıtracts, except in so far as relates to a vigorous prosecution of the
rk of opening the channel of Pass à l'Outre by the blasting of
·pedoes at the bottom of the channel.

In the meantime a careful examination of the channel in the South-
ıst Pass was made in the latter part of July, and shortly afterwards
C. A. Fuller, esq., who had been appointed as successor to William
hnson, from both of which it appeared that the main channel of
s pass had remained open up to the time of their examinations.

On the 31st of August last I was notified through the War Depart-
ınt, by William E. Starke, esq., agent for the contractors, that the
ırk of *opening* the channel at Pass à l'Outre was completed, and ready
inspection; and, in accordance with instructions from the Topo-
ıphical Bureau, I embarked on the first steamer for New Orleans,
d proceeded to the pass without delay, for the purpose of making
ɜ inspection called for.

On the 10th of September I made a careful inspection of Pass à
ʼutre, and on the day following visited and examined the condition
the channel in the Southwest Pass. My proceedings in reference
both passes are exhibited in copious details in my inspection
ɔort of the 23d of September last, a copy of which is hereto
pended.—(See appendix Doc. No. 6.)

In the report last cited it was distinctly stated in reference to Pass à l'Outre that the channel across the tidal bar was opened to the width and depth required, agreeably to the modified contract of Messrs. Craig & Righter, on the 10th day of September, 1858, and that on the day following the channel across the tidal bar at the Southwest Pass remained open and easy of navigation for vessels drawing not more than eighteen feet.

3. *Of the construction of a road from Fort Riley to Fort Kearney, in Kansas Territory.*—Captain E. G. Beckwith, United States army, agent.—This work was confided to my general superintendence in May last. The road mentioned, as well as another road leading from Fort Riley to the Arkansas river, had previously been under the special charge of Lieutenant F. T. Bryan, of the Topographical Engineers, but was subsequently transferred to the special charge of Captain E. G. Beckwith, of the United States army, who was required to act in conformity to my instructions in carrying on the work.

My instructions to Captain Beckwith, issued under date of June 10, 1858, will show with sufficient clearness the nature and objects of his duties in relation to the road. To a copy of these instructions hereto appended I take leave to refer.—(See appendix Doc. No. 7.)

The means applicable to the construction of the road consisted of two unexpended balances of appropriations made by Congress, viz: a balance of $413 09 for the construction of a road from Fort Riley to the Arkansas river, and a balance of $8,616 23 for the construction of a road from Fort Riley to Bridger's Pass in the Rocky mountains, of which the road under consideration is a part only. To the balance last mentioned must be added the proceeds that might result from the sale of a large number of mules and other public property procured for the construction of the road from Fort Riley to Bridger's Pass, and now remaining at Fort Leavenworth. No return of these proceeds has yet been rendered.

The commencement of the work was prohibited by the War Department till the sale above mentioned could be effected. The efforts of Captain Beckwith were directed to the accomplishment of this object, but proved unavailing, by reason of the low prices (less than half the real value of the articles offered) bid for the articles sold, (a comparatively small portion of the property to be sold,) when Captain Beckwith very properly deemed it advisable to arrest the progress of the sale, and retain for future disposal the unsold residue of the property, consisting of some forty-seven mules and other items of public property, such as wagons, harnesses, &c.

The failure to effect the sales on reasonable terms seemed to involve either the abandonment of the work for the present season, then far advanced, or the rescinding of the prohibition above mentioned. The latter alternative was adopted, and on application to the War Department the prohibition was duly rescinded. Accordingly arrangements were made for the speedy commencement of the work, and the contractors entered upon its execution early in the month of August last.

The receipts and expenditures on account of the construction of the

road within the fiscal year ending on the 30th June last are as follows, viz:

Receipts.

Unexpended balance of the appropriation for the construction of the road from Fort Riley to Bridger's Pass	$8,616 23
Unexpended balance of the appropriation for the construction of a road from Fort Riley to the Arkansas river	413 09
Amount of receipts	9,029 32

Expenditures.

For the second quarter of 1858	$181

This being the amount expended within the year. The expenditures as above include a charge of $29 41 on account of commutation of quarters and fuel for Captain Beckwith, which has been liquidated out of a small balance appertaining to the construction of a road from Fort Kearney to the Council Bluffs and still remaining in his possession.

Captain Beckwith's report on the progress made in furtherance of the construction of the road has not yet been received.

4. *Of disbursements and settlements on account of western rivers at large.*—Lieutenant Colonel S. H. Long, United States Army, agent.

Amount of unexpended balance on hand, July 1, 1857		$4,539 66
The expenditures during the last fiscal year are as follows:		
For the third quarter of 1857	$324 24	
For the fourth quarter of 1857	881 78	
For the first quarter of 1858	437 78	
For the second quarter of 1858	521 21	
Amount of expenditures for the year		2,165 01
Unexpended balance July 1, 1858		2,374 65
From which should be deducted on account of under charge for transportation for the second quarter of 1857, under this head this sum short		118 00
Hence the balance unexpended as above is		2,256 65

The manner in which this fund has been created and the objects to which it has been applied are sufficiently explained in a series of remarks contained in a letter to the Third Auditor of the Treasury Department, dated July 27, 1858, a copy of which is hereto appended, and to which I beg leave to refer.—(See appendix Doc. No. 8.)

This fund has recently been enlarged by adding thereto the balace of the proceeds resulting from the sale of various items of public property appertaining to the improvement of Red River at and near the raft.

The sum thus added is	$1,841 61
Hence the unexpended balance remaining to be accounted for under this head is	4,098 26

This balance will be applied to the liquidation of incidental expenses accruing from time to time on account of the duties relating to the improvement of western rivers at large, and still remaining under my charge.

5. *Improvement of the Ohio river, including Cumberland dam.*—Lieutenant Colonel S. H. Long, United States army, agent in part. The work done under this appropriation within the last fiscal year consists merely in the blasting of rocks in the Indiana chute, or channel of the falls of the Ohio, by Captain Jesse Vansickle, one of the falls pilots, who undertook and accomplished the work in part at the instance of sundry river men and others interested in the river commerce, and at his own risk and responsibility. Failing to obtain remuneration for his work, as he had been led to expect by and from his advisers, he was induced to apply to the War Department for relief.

On examination of the testimony in support of the claim, which amounted to $1,477 40, the Hon. Secretary of War sanctioned its allowance and directed payment thereof to be made as follows, to wit:

A balance of $1,148 11 of the appropriation under this head remaining unexpended, the Hon. Secretary directed that this balance should be applied to the liquidation in part of this claim. He also directed that the residue of the claim, viz: $329 29, should be liquidated out of the fund for the improvement of western rivers at large, and a full settlement was made accordingly. Hence the receipts and expenditures under this head will stand as follows, viz:

Receipts on account of improvement of the Ohio, including Cumberland dam	$1,148 11
Expenditures for the year on the same account	1,148 11

Thus all accounts under this head were finally balanced and settled in full in the 4th quarter of 1857.

6. *Improvement of the Mississippi, Missouri, and Arkansas rivers.*—Lieutenant Colonel S. H. Long, United States army agent.—During the last fiscal year nothing has been done, and of course, no expenditures have been incurred under my direction on account of the improvement of either of these rivers, consequently the balances remaining unexpended at the close of the last fiscal year, are the same as

those for the year ending on the 30th June, 1856. These balances are as follows, viz:

For the improvement of the Mississippi	$1,092 19
For the improvement of the Missouri	1,574 94
For the improvement of the Arkansas	1,894 12
Amount of unexpended balances	4,561 25

By orders from the Topographical Bureau, dated on the 23d of June last, and on the 6th of August following, I was directed to transfer to Captain J. W. Abert, the balances above stated "as a mode by which these matters shall be finally adjusted and settled."—(See Appendix, Doc. No. 9.)

In compliance with these orders the balances were transferred in due form to Captain J. W. Abert, on the 30th of August, 1858, and, of course, I am no longer accountable therefor. My accounts with the United States have been adjusted accordingly, and will be forwarded to the Topographical Bureau for final settlement, at an early date of the current quarter.

In conclusion, I take leave to offer a summary estimate of expenditures likely to be needed in the further prosecution of the works herein considered, during a period of five years from and after the 30th of June, 1859. The terms of the estimate and the reasons of their adoption, are explained with sufficient clearness in my annual reports of September 1, 1856, and September 1, 1857, to which I beg leave to refer. The estimate is as follows:

Objects for which appropriations are wanted.	Cost of craft and working same for the first year.	Annual cost of working craft for the 2d, 3d, 4th, and 5th years, respectively.
Improvement of Mississippi river	$172,900	$92,400
Improvement of Missouri river	94,600	59,100
Improvement of Arkansas river	58,900	38,400
Improvement of Red river	110,350	52,350
Improvement of Ohio river	71,700	38,700
Improvement of Illinois river	24,800	9,300
Supervision, inspection, &c., of the works at the mouths of the Mississippi for a term of 4½ years	13,178	

Respectfully submitted.

S. H. LONG,
Lieutenant Colonel Topographical Engineers.

Colonel J. J. ABERT,
Chief Topographical Engineers, Washington, D. C.

P. S. A sketch of the raft district extending from Shreveport to the southerly boundary of the State of Arkansas, and showing the

relative positions and extent of the existing rafts is herewith presented. The sketch also shows the impracticability of discovering any route for a navigable channel leading westward from the main river, between the head of Red bayou and the Arkansas line.

S. H. LONG,
United States Army.

P. P. S. Moreover I take occasion to remark, that I have very recently received a report from Captain E. G. Beckwith, showing the progress made in the construction of the road from Fort Riley, on the Kansas river, to Fort Kearney, on the Nebraska river, being a portion of the road from Fort Riley to Bridger's Pass, in the Rocky mountains. A copy of the report is hereto appended.—(See Appx. Doc. No. 10.)

S. H. LONG,
United States Army.

APPENDIX—Doc. No. 1.

LOUISVILLE, *January* 10, 1858.

SIR: In continuation of my inspection report of the 31st ultimo I have the honor to submit the results of my late inspection of the Red river raft and its environs.

My annual reports of September, 1856 and 1857, and sundry documents appended thereto, exhibit with sufficient clearness and precision the nature, extent, and results of the operations for the removal of the raft and other obstructions in the way of navigation prior to the month of September last.

From the representations made as above it appears that a portion of the old raft extending from the head of Dooley's bayou upwards, through a distance of about two miles, has been removed; also that Dooley's bayou channel or route, from its head downward, for a distance of about twenty miles, has been greatly improved by cutting away protruding points or capes, and by removing dead trees, stumps, and sunken logs from its bed. This channel now affords a depth of about three feet in the shoalest places during ordinary low stages of the river, but is still much obstructed in places by stumps, logs, &c., yet remaining to be removed. After entering Shiftail lake the channel in a few places becomes too shoal for low water navigation, and will require to be deepened by dredging.

Since the removal of the old raft above mentioned a new raft has been formed above, extending from the head of Elmer's bayou downward through the distance of about a mile.

About two miles above the head of Elmer's bayou an artificial channel one hundred and seventy yards long has been opened, and connects the main river with Dutch John's lake near the head of the latter. Through this channel the water rushes with great velocity, and has already contributed greatly to enlarge its capacity. From

this new outlet a navigable channel has been formed leading obliquely downward to a point near the lower end of the lake, where the water discharges itself through another artificial channel about two hundred and thirty yards long and forty to fifty feet wide, through which the water flows with a velocity of about four miles per hour. The opening of this channel was partially effected in a very low stage of water, but was interrupted before it could be completed by a rise of the river. Its completion will involve much excavation through a bed of stiff clay stretching across the site of the channel nearly on the level of low water surface. On deepening the excavation across this bed of clay and removing a few stumps and deadened trees from the line of its traverse through the lake, there is very little doubt that a continuous low water channel three to ten feet deep, and sufficiently commodious for navigation, will have been formed, by which the distance from the head of the artificial channel first mentioned to the foot of that last mentioned will not exceed half the distance of the detour of the main river between the same points.

A little above the head of this new channel another raft has been recently formed in the main river, extending upward, at the time of my late inspection, four hundred to five hundred yards. The freshet that has occurred since that time has probably brought down new accumulations of drift and increased its length.

In view of the probability that a new channel might readily be opened through the lake it was deemed advisable that the agent should at once engage in the removal of this raft, and the conveyance of its fragments into the lake, which may serve as a receptacle sufficiently capacious for the reception of the present raft and future accumulations thereto for an indefinite period to come. The agent was accordingly directed to employ the force at his command in effecting the removal and disposition of the raft in the manner just mentioned.

The accompanying sketch or chart represents the districts in which the various rafts by which the navigation of the river has been obstructed since the commencement of the year 1841 are situated, and shows, not only the localities and positions above noticed, but those hereinafter to be treated of, and is calculated to exhibit the features of the country in which the rafts are situated in a more intelligible view than could be effected by any other mode of representation.

The craft and other means of prosecuting the improvement now at the disposal of Agent Fuller consist of the light draft snag-boat Gopher, a hand machine boat, two yawls, two skiffs, and one iron row boat, all fit for use, though much worn in service. These are all moored for safe keeping near Coshatta Bluff, about half a mile below the newly formed inlet from Dutch John's lake.

The force employed on the work during the last season has been very unsteady and fluctuating. Frequent desertions have occurred; slaves employed for the season have, in numerous instances, been withdrawn by their owners as occasion for their employment at home seemed to require; and in several instances the force has been reduced by the sickness and death of employés.

A letter of the agent dated on the 9th of November last represents the condition of his force as follows:

"OFFICE RED RIVER IMPROVEMENTS,
"*Collinsburgh, Bossier Parish, November* 9, 1857.

"SIR: Having failed in my endeavors to procure laborers in this vicinity to supply the places of those withdrawn on the 12th instant, I have made a journey into Texas with the hope of supplying myself from the hands recently employed on the Pacific railroad and elsewhere. As far as *engaging* the requisite number I was successful, but up to this date none have reported themselves at the work. On their way hither they stopped at Shreveport, and I have learned that instead of proceeding to this place they shipped on board of a steamboat to New Orleans. Being still, therefore, without a force to carry on the work, and the urgency of the case admitting no further delay, I purpose to leave again on to-morrow, the 10th instant, for Alexandria, and if necessary New Orleans, and obtain the requisite number of hands if possible. I am in hopes that the present state of the financial affairs of the country may have had the effect of reducing wages to my price, and thus the main difficulty hitherto experienced in recruiting will be removed.

"Since my last report nothing has been done in furtherance of this improvement, save the caulking and repairing of some of the water craft, and the safe keeping of the public property.

"Very respectfully, sir, your obedient servant,

"CHAS. A. FULLER,
"*United States Agent and Engineer.*

"Lieut. Col. S. H. LONG, *U. S. A.*,
"*Louisville, Kentucky.*"

The journey proposed as above was performed, and the desired number of laborers were obtained at New Orleans and conveyed thence to Coshatta Bluff, near the raft, where they arrived on the 3d of December last and commenced work.

The party thus reinforced consists of the agent, one surveyor and supervisor, one mate or foreman, one cook, one washerwoman, and thirteen laborers, in all eighteen individuals. In addition to the force above enumerated, the agent has in employ one horse, three mules, one wagon, and one cart, all procured for the public service.

The funds in the possession of Agent Fuller on the 1st of October, 1857, and remaining applicable to the further prosecution of the work on Red river amounted to $10,217 35, as inferrable from the official returns of that officer. This amount has been considerably reduced by payments made to sundry individuals since that date, but to what extent has not yet been ascertained.

On the re-organization of the party as above, they were at once employed in the removal of the recent raft, formed immediately above the new channel leading into Dutch John's lake, and conveying its timber contents through this channel into the lake as before intimated.

In consideration of the character and aspect of the valley district in which the existing rafts are situated, and especially in view of the declivity of its surface towards its westerly margin as indicated not only by sundry lines of levels traversing the valley in various directions, but by the uniform tendency of the currents of the outlets and bayous to flow from the easterly towards the westerly margin of the district, it was also deemed advisable to make a careful examination of that portion of the valley situated above the head of the Red bayou for the purpose of ascertaining the practicability of opening a navigable channel leading from the main river at some point above Boom Bend, and passing thence by favorable natural channels in a direction to unite with Black bayou at or near the entrance of Sewell's canal, where it would become coincident with the Red Bayou route and continue to pass downward in the same channel to the head of Clear lake, &c.

Having been informed that the prospect of finding a practicable route in the direction and through the localities above indicated was favorable, I issued the following instructions to the agent on the 3d of December last, directing his attention to the examination of the district in which it is supposed to be situated.

SIR: In addition to your duties relating particularly to the removal of the existing raft and other obstructions connected therewith, you are desired to make careful examinations of all outlets leading westwardly from Red river to be found within and near the northern boundary of Louisiana, with the view of ascertaining the practicability of opening a navigable channel between the river and Black bayou, and thence downward in the latter to its junction with the pass called Sewell's canal.

In the reconnaissance contemplated above the outlet called O'Rourke's slough, about a quarter of a mile above Boom Bend and near the northern limit of Louisiana, is believed to be worthy of attention.

You are expected to embrace the first favorable opportunity for making the examination, and to report the results thereof, together with your views in reference to the advisability, as well as to the practicability of opening a navigable channel in the direction and through the extent indicated.

Respectfully, sir, &c.

S. H. LONG,
Lieutenant Colonel Topographical Engineers.

C. A. FULLER, Esq.,
United States Agent.

In further explanation of the chart and of the nature and character of the obstructions and difficulties in the way of navigating the river; also of the motives that induced the foregoing instructions the following cursory remarks are offered, viz:

1. The faint shade lines drawn obliquely across the river indicate the positions and extent of the existing rafts.

N. B. The rafts consist of two varieties, viz: compact sunken raft, and compact floating or buoyant raft—the former consisting of logs, &c., that have remained long in the water, became water-soaked, and sunk to the bottom of the river surrounded by more recent accumulations, while the latter are composed of still more recent accumulations of similar materials, which remain buoyant for three or four years, and in their turn sink to the bottom and are converted into sunken raft.

2. The depths of the river where no rafts exist, are represented in feet by figures inserted in the channel.

3. The dotted wavy line extending from O'Rourke's slough to the point of confluence of Sewell's canal with Black bayou, indicates the supposed course of the contemplated new route.

4. The tract through which this route passes, has seldom been explored, and of course very little is known of its character, aspect, water-courses, &c.

5. The head of O'Rourke's slough is situated about midway of the river valley, and the descent thence toward the easterly margin of the valley is less considerable than that from the head of any other outlet from the river below that point to the same margin, and of course the current from the point just mentioned is likely to be less rapid than it is through any of the bayous below.

6. Moreover, the descent from O'Rouke's slough, and along the westerly side of the valley, or by way of Black bayou, is likely to be more equable and uniform than that by any other channel leading from the main river to the junction of Sewell's canal with Black bayou.

7. In this connexion it is proper to observe that Red bayou is very narrow and exceedingly tortuous, and in places presents rapids that cannot be passed by ascending steamers, without the tedious process of *warping*. Moreover, the head of this bayou is situated about 1¼ mile only above the head of the present uppermost raft, and it is in danger of being blocked up in the course of a few years by new accumulations of rafts.

8. The desideratum hoped to be achieved by the reconnaisance required as above, viz, the discovery of a practicable route for navigation, approximately in the direction indicated on the sketch, will undoubtedly have a tendency to obviate or avoid many of the difficulties that now exist in the way of navigation, and will be likely to result in a more permanent improvement than can be effected in any other way.

9. The following remarks relate more particularly to the origin, progress, and results attendaut on raft formations, especially to those represented on the chart:

10. The origin of a raft is occasioned by obstructions in the channel of the river, that intercept and bar the downward progress of floating trees, logs, and other drift. Its prolongation is invariably upward, being occasioned by accumulations of drift wood and other materials immediately above its origin, or at its head.

11. The raft of 1841 had its origin at a point about 2½ miles below

Carolina bluffs, soon after the operations under Captain H. M. Shreve were concluded, and in the year just designated had been prolonged upward through the distance, and to the lower point of the bluffs above mentioned. This raft was partially, if not entirely removed in 1841–'42, and '43.

12. Soon afterwards another raft originated at a point near the head of the removed raft, and has since been prolonged in like manner through a distance of about thirteen miles, to a point about two miles above the head of Dooley's bayou, or 1¼ mile below the head of Elmer's bayou.

13. A new appropriation having been made for the improvement of Red river at and near the raft, its expenditure in the execution of preliminary surveys for determining the most feasible method of improvement, and in removing such portions of this raft as were in the way of applying the method, was confided to C. A. Fuller, esq., in 1854, then and ever since the United States agent for this work.

14. The method alluded to involved the removal of that portion of the extended raft situated above the head of Dooley's bayou, and embracing a distance of about two miles. This portion was broken up and removed under the direction of the agent in 1856, while the residue, embracing an extent of about eleven miles, still remains unremoved.

15. At a point a little above the removed portion just mentioned, and subsequently to its removal, a new raft originated and was prolonged upward about half a mile; and again, about 400 yards above the head of this raft another new raft originated, and was prolonged through about the same distance to the head of Elmer's bayou. Both of these rafts remain to be removed, while the unexpended balance of the appropriation is obviously too small to justify any attempt to remove them.

16. About two miles above the head of Elmer's bayou, at a point a little above the artificial outlet leading from the river into Dutch John's Lake, is the origin of another new raft, about 450 yards long, formed during the last season. The force under Agent Fuller is at this time successfully occupied in the removal of this raft, which is the uppermost of the rafts now in the river.

The three rafts last mentioned, which embrace an aggregate length of about 1¼ mile, are the only impediments of this character that remain in the way of steam navigation.

17. The aggregate extent of raft formations that have occurred, since the operations of Captain Shreve terminated, or during a period of about eighteen years, amounts to about fourteen miles, or to an average of four-fifths of a mile in each year.

18. All bayous connected with the main river within the raft district represented on the chart, especially those on the westerly side of the river, are outlet bayous, discharging their waters in a direction tending toward the westerly side of the district.

19. The quantity of water discharged through these outlets respectively, becomes more and more reduced as the head of the raft advances upward; while the quantity discharged through outlet

channels situated above the raft is augmented in a corresponding degree.

20. For example, Shiftail and Cowhide bayous, below the present old raft, which were formerly copious outlets, now discharge comparatively but a small quantity of water, whereas Dooley's bayou, which formerly discharged but a small quantity of water, is now the channel of an abundant out-flow. In like manner the discharge through Elmer's bayou, and also that through Red bayou, both situated above the rafts formed in 1856, has been much enlarged since the formation of these rafts.

21. In the event that the new rafts remain undisturbed, their prolongation upward will be continued, and the out-flows through Dooley's and Elmer's bayous will be diminished, while the discharge through Red bayou will be augmented; and when the raft shall have been prolonged till it reaches the head of Red bayou, (which is only 1¼ mile above the head of the uppermost rafts,) the discharge through this bayou will be reduced, and the out-flow through O'Rouke's slough, or some other outlet above Red bayou, will be increased.

22. The results anticipated as above as well as those already experienced, will undoubtedly be produced, unless timely remedies and precautions are taken to prevent their occurrence; for while the passage of the water down the main river becomes more and more obstructed by prolongations of the raft, new outlet channels must be formed above the head of the raft, in order to give the necessary vent to the volume of the river.

23. In order to meet the exigencies of the case under consideration, and prevent evils apprehended as above, I take leave to repeat my estimate of annual appropriations for five consecutive years, "on account of the improvement of Red river in the vicinity of the raft," as exhibited in my annual report of September last, which is of the following import.

24. Estimate for the improvement of the navigation of Red river at and near the raft, during a period of five consecutive years:

Propable cost of craft, including a new dredge, scows, &c., together with equipments for the same	$28,000
Annual cost of working and preserving the same, $52,350. Cost of working same for five consecutive years	261,750
Amount for craft and working same, five years	$289,750

This amount is proposed to be applied annually, as follows:

For the 1st year, counting cost of new and repairs of old craft	$80,350
For the 2d, 3d, 4th, and 5th years, respectively	52,330

The sums above estimated, if seasonably appropriated and judiciously applied, will no doubt be amply sufficient to open and keep opened a navigable channel through the raft district, during the term of years for which the estimate is computed.

S. H. LONG,
Lieutenant Colonel, Topographical Engineers.

Colonel J. J. ABERT.

N. B Examinations and inquiries made since the date of the foregoing report, show pretty conclusively that a new navigable channel, situated on the westerly side of the river valley, between the northern boundary of Louisiana and Sewell's canal, as contemplated in the report, and especially in paragraphs 3, 4, 5, 6, 7, and 8 of the same report, is utterly impracticable. The chart herewith has been altered and amended in a manner to show the impracticability of such a channel.

S. H. LONG, *United States Army.*

APPENDIX—Doc. No. 2.

WASHINGTON, *June* 19, 1858.

SIR: I take leave to represent that the appropriation for the removal of the Raft of Red river is nearly, or quite exhausted; and that no new appropriation for the further prosecution of that service appears to have been made by Congress at their last session. I would further represent that sundry items of water craft, and other appliances procured on account of the service in question, must, in consequence lie useless and be subject to decay and ruin unless disposed of for such consideration as may be obtained therefor.

Accordingly, I take leave to suggest that I be authorized to direct the suspension of the work in question, and instruct Agent Fuller to sell the various articles of public property appertaining thereto (the surveying instruments excepted) at public sale or otherwise, on the most favorable terms that may be offered for the same; also, that the agent, after having effected the sale as above, be directed to repair to my office at St. Louis, report his proceedings in the premises, and transfer all unexpended balances, including the proceeds of said sale, together with the instruments mentioned, to my custody at St. Louis.

I further take leave to suggest that Agent Fuiler be continued in the public service at the rate of compensation allowed him as agent for the removal of the raft, (should he desire to remain in the public service on these terms,) with the understanding that he will serve as supervisor of the operations under the contracts for the removal of obstructions from the mouths of the Mississippi at the Southwest Pass, and at Pass a l'Outre.

S. H. LONG,
Lieutenant Colonel, Topographical Engineers.

Colonel J. J. ABERT.

APPENDIX—Doc. No. 3.

OFFICE RED RIVER IMPROVEMENT,
September 15, 1858.

SIR: I have the honor to submit my report on the state and progress of the work committed to my charge, viz: the improvement of Red river at and around the Raft, for the fiscal year beginning July 1, 1857, and ending June 30, 1858; and also my final report on the same work, consequent upon the suspension of operations and the sale of all public property pertaining thereto.

The receipts and expenditures during the year on account of this service are as follows, viz:

Receipts.

Balance on hand July 1, 1857		$13,040 13

Expenditures.

Amount expended 3d quarter, 1857	$2,818 58	
Amount expended 4th quarter, 1857	3,425 68	
Amount expended 1st quarter, 1858	2,598 43	
Amount expended 2d quarter 1858	2,248 07	
Total expended		11,090 76
Balance on hand, June 30, 1858		1,949 37

No appropriation having been made by Congress for the continuance of this work during the last fiscal year, and the unexpended balance at its commencement being inadequate to the vigorous prosecution thereof, the expenses were reduced to as small a monthly expenditure as possible, in order that the work might be kept open and the public property preserved until the action of the ensuing Congress could be known; a total suspension of the work at that time being regarded as very disastrous and almost fatal to its successful completion. Accordingly a force of from twelve to fourteen hands was kept at work during the year, and has been successful not only in keeping the bayou open, but also in removing a large amount of raft into the Dutch John lake receptacle. For the reports accompanying my quarterly accounts during the last fiscal year, as well as to my several communications of the 1st April, 13th May, 3d June, 7th and 22d July, I would respectfully take leave to refer you for any further information you may desire in reference to the details of the work.

The present state of the improvement is nearly the seme as exhibited in my last annual report. A considerable amount of raft that had lodged in the upper part of Dooley's bayou, has been removed during the year, and stored in the first small lake about six miles from the head of the bayou. Three heavy freshets having

ırred during the winter months, a large addition was made to the above the inlet to Dutch John's lake. About seven hundred ls of the raft has been saved, removed and stored in the lake. rly a mile of raft, however, still remains, the head of it being ıin about four hundred yards of the inlet into Red bayou. One e rise will probably close the entrance into the bayou, thus ing off all communication between upper and lower Red river. troops, military stores and other supplies for the posts in that ion of the country must then be transported by land carriage ınd the raft, at a heavy expense, which in a few years will be rmous in comparison with the small amount now requisite to come the improvement. Every year's delay, as I have already arked in my former reports, but increases the ultimate cost of this rovement. And the present suspension of the work, together ı the sale of all public property pertaining thereto, (which must ɔurchased anew on its resumption) will require an increase of my year's estimate of more than 50 per cent.

n the 18th of July I received your instructions of the 28th of e, which, under sanction of the honorable Secretary of War, cted a suspension of the work for the removal of Red River raft, a sale of the property pertaining thereto. Having already been ised of the failure of the desired appropriation, and having recomded the suspension and sale thus authorized, I had taken the prenary steps in the case, by despatching the Gopher and other lic property, *via* the new route to Shreveport, and by advertising same for sale by public auction.

he Gopher, although detained by the stumps in that part of the ɔu which had not been worked, made her trip to Shreveport essfully, drawing three and a half feet water, and at so low a e of the river that all boats, even of the lightest draft, had been ıdrawn from the Red bayou route for weeks, thus demonstrating ıfactorily that had these stumps been removed, as well as the paratively small amount of raft now remaining in the upper part ted river, the new route was entirely susceptible of navigation n all others had failed.

n the 24th of June I sold, by auction, at Collinsburg, the mules, ɔn, carts, &c.; the net proceeds of the sale amounting to $529 26. hedule of the property sold as above is as follows:, viz:

Schedule of sales of public property pertaining to the improvement of Red river, by E. Lynn, auctioneer at Collinsburg, Louisiana, July 24, 1858.

No.	Designation, &c.	To whom sold.	Price.	Amount.
1	Yawl (worn out)	W. Hall	$5 00	$5 00
1	Grindstone	E. Lynn	1 00	1 00
1	....do	B. H. Nelson	85	85
1	....do	B. H. Nelson	1 75	1 75
1	Cart and harness	G. H. Walker	21 00	21 00
1	Wagon and harness	T. J. Caldwell	50 00	50 00
1	Tent and poles (much worn)	T. J. Caldwell	9 00	9 00
1	Mule	John Hamilton	116 00	116 00
1	Mule	John Hamilton	160 00	160 00
1	Mule	John Hamilton	170 00	170 00
				534 60
	Less commissions one per cent.			5 34
	Net amount			529 26

I certify that the above schedule of sales by me at public auction this day is correct; that the gross amount thereof is $534 60, and that my legal commissions on said sales as auctioneer is one per cent. or $5 34, leaving the net amount as above $529 26.

E. LYNN,
Constable and Auctioneer.

$529 26.

COLLINSBURG, *July* 24, 1858.

Received the above amount, viz.: $529 26, as sold by E. Lynn, constable and auctioneer.

CHAS. A. FULLER,
United States Agent and Engineer.

On the second of August, the Gopher, machine boat, and other property, were sold at Shreveport to the highest bidders as had been advertised; the net proceeds of this sale amounted only to $1,872 82. The following is a schedule of the sales made on this occasion:

Schedule of sales of public property pertaining to the improvement of Red river, made under the direction of C. A. Fuller, United States agent and engineer, by A. L. Heine, auctioneer, Shreveport, Louisiana, August 2, 1858.

Lot.	No.	Designation.	To whom sold.	Price.	Amount.
1	1	Steamer Gopher and machinery	A. Kimble		$1,175 00
2	1	Machine boat, with skiffs, yawl, chains, and iron, &c., &c	Wm. Thatcher		290 00
3	2	¾-inch cable chains; 8 small ditto, (3,127 lbs.)	A. Kimble	$0 01⅞	58 64
4	1	Lot square chains, 814 (lbs.)	do	1½	12 21
5	1	Lot assorted rigging, (worn out)	Capt. McMillen		32 00
6	1	Lot 1½-in. purchase chain, (1,693 lbs)	Wm. Thatcher	⅞	14 81
7	3	Pairs iron shears, (780 lbs.)	T. W. Jones	2½	19 50
8	4	Fiddle-blocks	R. A Cutliff	2 50	10 00
9	1	Lot snatch-block, (much worn)	Wm Thatcher		2 00
10	25	Long shovels	H. Kneeland		9 50
11	31	Spades	Dr. Vance		9 50
12	22	Augers, assorted	G. P. Thompson		5 00
13	10	Picks	A. Kimble		5 00
14	10	Cross-cut saws, 6 feet	do	1 10	11 00
14	5	do 6½ feet	Caldwell	1 20	6 00
14	3	do 8 feet	do	2 00	6 00
14	6	do 7½ feet	do	1 50	9 00
15	4	Crowbars	A. Kimble	1 50	6 00
16	1	Shackle bar	do		1 25
17	2	Prs. double and treble blocks, 14-in.	Wm. Thatcher	1 00	2 00
18	2	do do 8-in.	R. A. Cutliff	2 00	4 00
19	1	Pr. double and treble blocks, 7-in.	Dr. Vance		2 00
20	1	do do 6-in.	R. A. Cutliff		2 50
21	1	Pr. double and single blocks, 8-in.	Wm. Thatcher		1 50
22	8	Double and single blocks, 6-in	do		2 75
23	1	Lot chisels	Christian		2 10
24	1	Clamp-screw	T. Jacobs		2 20
25	1	Jack-screw	G. P. Thompson		2 25
26	15	Old axes	A. Kimble		3 75
27	5	Broadaxes	Caldwell	1 25	6 25
28	2	Hand saws, and 2 wood saws	L. Knox		2 00
29	1	Lot old stumps and iron, (446 lbs.)	A. Kimble	3	13 38
30	1	Marlinspike, 2 ladles	R. L. Gilmer		70
31	1	Box tin, (rusty)	A. Kimble		2 00
32	1	Lot pike poles	R. L. Gilmer		70
33	8	Kegs blasting powder, (damaged)	H. Kneeland	2 50	20 00
34	1	Saw sett	L. Knox		80
35	2	Fire pans	A. Kimble		50
36	1	Anchor, (broken)	Wm. Thatcher		7 50
37	5	New axes	Dr. Vance	90	4 50
38	1	Heading beach	Stewart & Jewett		3 00
39	1	Grindstone	R. L. Gilmer		1 75
40	3	Monkey wrenches	A. Kimble	1 25	3 75
41	1	Corn mill	Caldwell		1 00
42	1	Cooking stove, &c	J. B. Merritt		26 00
43	2	Globe lamps	W. Fulsom		1 00
44	27	Bars solder	A. Kimble		2 50
45	1	Sheet gum packing	McMillen		3 25
46	1	Yawl	W. Fulsom		15 50
47	1	Iron boat	do		26 00
48	1	Lot wood	A. Kimble		15 00

SCHEDULE—Continued.

Lot.	No.	Designation.	To whom sold.	Price.	Amount.
49	3	Whip saws	T. W. Jones	$1 00	$3 00
50	1	Stove and pipe	A. Kimble		3 00
51	2	Stoves and pipe	R. A. Cutliff	3 00	6 00
52	1	Lot spikes and nails	Wm. Thatcher		6 00
53	1	Lot iron, (525 lbs.)	Stewart & Jewett	3	15 75
54	4	Tent clothes, (worn out)	McMillen		5 00
55	1	Signal lamp	do		75
56	2	Lanterns	Caldwell		75
57	1	Lot pig lead	Wm. Thatcher		1 00
58	1	Lot pig lead sinkers	do		50
59	1	Set stocks and dies	Llewellyn		8 00
60	1	Lot cold chisels and punches	G. W. Christian		3 25
61	1	Lot files, steel	Stewart & Jewett		75
62	1	Rachet drill	R. L. Gilmer		2 50
63	6	Buckets	Stewart & Jewett		25
64	1	Lot files and rasps	A. Kimble		10 00
65	5	Papers rivets	do		1 10
66	1	Box lustre, emery, &c	McMillen		1 00
67	1	Pair bellows	R L. Gilmer		16 50
67	1	do	G. W. Christian		11 25
68	1	Furnace and pipe	R. L. Gilmer		1 00
69	1	Vice	A. Kimble		10 50
70	1	Vice, (ruined by fire)	Christian		1 00
71	1	Anvil, (129 lbs.)	R. L. Gilmer	5½	7 10
72	1	Lot blacksmiths' tools	do		13 00
73	6	Wrenches	do		2 00
74	1	Lot hammers and hatchet	Hall		1 50
75	52	Fire brick	McMillen	3½	1 82
76	1	Lot tubes, &c.	L. Knox		1 10
77	3	Stoves	Cutliff	1 00	3 00
78	2	Boxes soap	Cash		1 25
79	1	Table and contents	A. Kimble		3 00
80	1	Box tea	W. Fulsom		2 00
81	5	Chairs, table	Miller		1 20
82	3	Mattresses and blankets	Dick		1 75
83	1	Lot beeswax, (15 lbs.)	Dick	11	1 65
		Amount			2,013 76

Amount		$2,013 76
By commissions, labor, and tax	$90 62	
By collecting bills and advancing	50 32	
		140 94
Net		$1,872 82

I certify that the above schedule, amounting to $2,013 76, exhibits a correct statement of the articles sold, the persons to whom sold, and the prices at which they were disposed of; also that my commission for the sale is 4½ per cent., including taxes, labor, clerk hire, &c., and the amount of $50 32 is the charge for collecting and advancing, as customary.

A. L. HEINE, *Auctioneer.*

SHREVEPORT, *August* 3, 1858.

Received the above net amount, viz: $1,872 82 from A. L. Heine, auctioneer, August 3, 1858.

C. A. FULLER,
United States Agent and Engineer.

The scarcity of money in Shreveport at the time; the unfavorable season of the year at which the sale was made; and the payments being required in cash, caused the property to be sacrificed at much less than its real value. With respect to the Gopher, however, I would here remark that her hull was almost entirely worn out and useless, and that she was bought for her engines alone, which being small and with slide valves, were not very desirable.

Sundry articles of property were disposed of by me at private sale at fair prices; the proceeds amounting to $213 78. The following is an exhibit of the property disposed of in this manner.

Schedule of sales of property pertaining to the improvement of Red river, by C. A. Fuller, United States agent and engineer, at private sale.

Date.	To whom sold.	Designation of property.	Price.	Amount.
1858.				
July 3	J. J. Tumley	1 water jar	$8 00	$8 00
	Wm. Hall	1 grindstone	2 50	2 50
		2 kegs rifle powder	6 00	12 00
		3 gallons lard oil	1 35	4 05
31	G. H. Walker	1 tin meat safe, damaged	2 50	2 50
		1 office press, for books, &c	8 00	8 00
		1 office washstand, bowl, &c	2 00	2 00
		1 office table, small	2 00	2 00
	L. A. Davidson	1 office desk	7 00	7 00
		39 pounds sheet iron	7	2 73
		Lot coal	5 00	5 00
	T. J. Caldwell	1 horse	140 00	140 00
		1 saddle, bridle, &c., much worn	10 00	10 00
		3 old dinghees	1 00	3 00
	J. A. Herron	3 whip saws	1 00	3 00
Aug. 3	Wm. Fulsom	1 old work bench	2 00	2 00
		Amount of sales		213 78

I certify that the above schedule exhibits a true and correct statement of all articles of public property sold by me at *private sale*, and that the total amount thereof is as above stated, viz: two hundred and thirteen dollars and seventy-eight cents.

CHARLES A. FULLER,
United States Agent and Engineer.

The following is a summary of the sales and proceeds, as above:

July 24, public auction	$529 26
August 2, public auction	1,872 82
August 3, private sales	213 78
Amounting to	2,615 86

On the 4th August I left Shreveport for St. Louis, agreeably to your instructions, and *en route* visited the works at the Southwest Pass of the Mississippi, as desired by you. My report on that inspection has already been rendered under date of the 3d instant.

In conclusion, I take leave to submit an estimate for the completion of the improvement of Red river at and around the raft, and also the amount that will be required for the next fiscal year.

Estimate.

Amount required for completion, as per last annual report, September, 1857	$110,000 00
For construction of new boats, purchase of tools, machinery, &c., to supply the place of those sold	30,000 00
Removing new raft that will accumulate prior to resumption of work	20,000 00
Additional receptacle for new raft	12,000 00
Contingencies, say	3,000 00
Amount required	175,000 00

Amount required for the next fiscal year.

For new snag-boat, purchase of tools, &c	$30,000 00
For new dredge-boat and scows	10,000 00
For new raft receptacle	12,000 00
For working dredge-boat per year	10,000 00
For working snag-boat per year	42,000 00
For contingencies	6,000 00
	110,000 00

CHARLES A. FULLER,
United States Agent and Engineer.

Lieutenant Colonel S. H. LONG,
United States Army.

P. S.—My accounts for the current quarter, final account current, &c., will be prepared and forwarded as early as practicable. Up to this date I have not yet been able to settle all outstanding accounts. As soon as the desired vouchers can be obtained the accounts will be closed, and the balance of funds remaining unexpended will be duly turned over to you.

C. A. F.

APPENDIX—Doc. No. 4.

LOUISVILLE, *December* 31, 1857.

SIR: Pursuant to your instructions of the 31st October last, I visited the Southwest Pass of the Mississippi on the 19th of the ensuing November, and on the 2d of December following engaged in examinations and inquiries in relation to operations in progress for the improvement of Red river at and near the raft, and I now have the honor to submit my views and the results of my observations and inquiries in reference to the works in progress at those two localities.

Southwest Pass.

The operations of Messrs. Craig & Righter, contractors for the improvement of the Southwest Pass and of the Pass a l'Outre, have hitherto been confined exclusively to the improvement of the former, nothing having yet been done towards the improvement of the latter pass.

The work done in the Southwest Pass consists in the formation of a single line of wing-dam, 5,733 feet long, composed of square and plank piles driven firmly into the bed of the pass, and strongly banded together at and near the surface of the water by means of streamers or ribands, iron spikes and bolts, in the manner heretofore explained in my inspection report of the 6th April last. The general direction of the dam is about N. 40° E., or S. 40 ° W.

At the upper or northerly extremity of the dam the water does not exceed 3 feet in depth; as we descend along the line of the dam the depth gradually increases to about 12 feet, which is the depth at the lower end of the dam.

Through a distance of about 1,500 feet on the upper portion of the dam indurated beds of sand and clay occurred at the depth of 6 or 8 feet below the water surface. On being penetrated by the piles these beds, thus disturbed, resolved themselves into a sort of quicksand, too yielding to afford the requisite stability to the piles. In consequence, and on the occurrence of protracted boisterous weather soon after this portion of the dam was built, the line of piles was ruptured, and in some instances thorough breaches of greater or less extent were formed in it.

The residue of the dam being strongly fortified by substantial square piles driven on both sides of the plank piling, and at intervals of only 4 or 5 feet asunder, sucessfully withstood the buffetings of the storms and the surf produced thereby, and still remains erect and stable.

The construction of the line of piles above considered comprises all the work done by the contractors prior to the date of my late inspection. The wing-dam contemplated to be formed on the northwesterly side of the pass remains to be constructed, which is also true of the

several traverse dams across the heads of outlets on both sides of the pass, which were conditionally provided for in this contract. All these subsidiary works, together with an additional prolongation of the line of the dam already built, remain to be formed.

The materials used in the formation of the dam, exclusive of a large quantity driven away and lost in storms, amount to about 2,000,000 superficial feet of yellow pine and cypress lumber, and five tons of iron in bolts and spikes.

The materials on hand, and applicable to the further prosecution of the work in the Southwest Pass, consist of 150,000 feet, board measure, of plank piles, varying in length from 12 to 35 feet, of about 500 square piles, 25 to 45 feet long, and of about four tons of iron in bars, bolts, and spikes, all on hand and ready for use.

The craft employed on the works includes the steamer Fanny Fern, fitted up with a double pile engine worked by steam power; also of a pile boat called the Little Fanny, fitted up with a similar pile engine worked by steam, together with sundry flat boats, yawls, skiffs, &c.

The force employed in the service consists of two captains, two steam engineers, two foremen, one blacksmith, one striker, two cooks, and twenty-three laborers; in all thirty-three individuals.

Owing to the unusual prevalence of boisterous and stormy weather during the last three months, the work of the contractors has been greatly retarded. From reliable information it appears that during the period first mentioned, only eight or ten working days have occurred in which the work could be prosecuted to any considerable advantage.

In consideration of the interruptions and delays, and in view of the utter impracticability of accomplishing the works of their contracts, within the period of their late extension, viz: to the 1st of January next, the contractors made application for another extension of the term of their contracts to the 1st of July next.

The following is a copy of the application alluded to:

SOUTHWEST PASS,
November 21, 1857.

SIR: Inasmuch as we the contractors for the improvement of the Southwest Pass of the Mississippi river are desirous of again applying to the Hon. Secretary of War for another extension of the contract time, and inasmuch as we believe that said application must, in the routine of official business be first submitted to the government officer in charge for his approbation before the same can be granted, we, therefore, are desirous of learning from you whether in such an event your report would be favorable to such extension.

The grounds upon which we should ask an extension are as follows:

1st. The extraordinary prevalence of boisterous weather during the past fall, not leaving more than ten or twelve working days, thereby materially retarding our operations.

2d. The fact that the river has been unusually low during the past three months, and in consequence thereof, the agency we depended

upon for the accomplishment of the results desired, was not in existence.

3d. The fact of the past and present commercial crisis having so far prostrated the money market, that the obtaining of the necessary funds was an impossibility.

4th. That we have expended a large amount of cash which will be a total loss to us in case the government refuses to grant us a renewed extension.

5th. That in order to facilitate the operation of the current and to open the pass to the required depth at the earliest date practicable, the contractors are prepared to call in play the agency of the rake, harrow, and scraper, which they believe will accomplish the end desired long before the expiration of the extension time applied for.

An early answer will much oblige,

CRAIG & RIGHTER.

Lt. Col. S. H. LONG.

NEW ORLEANS, *November* 27, 1857.

SIR: I have the honor herewith to submit an application of Messrs. Craig & Righter, contractors for the removal of obstructions from the mouths or outlets of the Southwest Pass and Pass a 'lOutre, soliciting an additional extension of the term or period of their contracts.

The arguments urged in favor of the extension appear valid and forcible, and I take leave briefly to comment thereon in the order of their presentation in the application:

First. Agreeably to my own observations and inquiries, and in accordance with the reports received from William Johnson, esq., supervisor of the pass in my employ, the statements in this item of the application appear to be fully sustained.

Second. The stage of water in the pass during the time mentioned in this item appears also to have been correctly stated. No acceleration of the current appears to have occurred during the time mentioned.

Third. The late embarrassments in money affairs are too well known to need any comment.

Fourth. The expenditures on the work have undoubtedly been very large. I have been credibly informed that they have already amounted to at least $60,000.

Fifth. The proposal contained in this item in reference to the adoption of the method of dredging by the use of rakes, harrows, and scrapers, in connexion with the wing-dams contemplated as the means of improving the channels, is, in my opinion, not only acceptable, but advisable. The combination of the two methods, viz: the construction of wing-dams combined with the process of dredging, will be likely to prove more efficacious than either of the methods, singly adopted.

It appears manifest that the contractors undertook the work with-

out due consideration of the numerous casualties and difficulties in the way of its successful prosecution. They seem to have been impressed with the idea that the channels could be improved by the removal of soft mud from their bottoms and sides, instead of which indurated beds of adhesive clay called *mud lumps* were the formidable obstructions in the way of navigation. They seem to have anticipated very little interruption from stresses of weather, which prevail more or less violently in every month of the year at the outlets of the Mississippi into the Gulf. No injuries to the work appear to have been anticipated from the surf and lashing of the billows of the Gulf, whereas extensive breaches have frequently been made in the line of piles by agencies of this character. These and numerous other incidents, neither foreseen nor provided for, have not only contributed to retard the progress of the work, but to occasion heavy outlays in repairing damages done to it.

In view of all the circumstances of the case, and especially in consideration of the proposal to apply harrows, scrapers, &c., for the purpose of breaking up and removing the mud lumps and hard bars that occur in the channels, (a method of operation that has proved successful and efficacious on a former occasion,) I do not hesitate to commend the application of the contractors for another extension of their contracts to the favorable consideration of the War Department.

In regard to the duration of the extension asked for, no limit has been fixed by the contractors. I would therefore respectfully suggest that it be limited to the 1st of July next, which the contractors regard as an ample allowance of time for the fulfillment of their contracts.

I take leave to signify my belief that one of the stipulations of the contract is a hard one, viz: that requiring the excavation of the channels across the bars to the depth of twenty feet. Agreeably to the best lights I can obtain in reference to this matter I am satisfied that this depth cannot be obtained by any means whatever, without a consideration greatly exceeding that specified in the contracts. In my inspection report of April last I hazarded the opinion that eighteen feet should be the maximum depth that ought to be aimed at in improving the outlets of the Mississippi into the Gulf. I am still of the same opinion, and would further suggest the propriety of adopting eighteen feet below ordinary low tide (instead of the stipulated twenty feet) as the maximum depth practicable across the tidal bars at the outlets of either of the passes into the Gulf.

S. H. LONG,
Lieutenant Colonel Topographical Engineers.

Colonel J. J. ABERT.

NEW ORLEANS, *November* 27, 1857.

GENTLEMEN: Your application for a renewed extension of your contracts in relation to the "removal of obstructions from the mouths of the Mississippi" has been received. In reply, I take leave to inform

you that the application will be at once forwarded to the Topographical Bureau accompanied by a report thereon, setting forth my views in reference to the propriety of granting the indulgence solicited.

A copy of my report as above, is herewith submitted for your use and information.

S. H. LONG,
Lieut. Colonel T. E.

Messrs. Craig & Righter.

With regard to the stipulation specially noticed in the concluding paragraph of the foregoing report, it is proper to advert to some of the bids, exemplifying the estimated probable cost of improving the channels of the Southwest Pass and of Pass à l'Outre by different competitors for the contracts. The proposals of the inexpert firm of Craig & Righter for opening the two passes, made in 1856 compared with those of the New Orleans Towboat Company in the same year and for the same work, (the latter having had great experience both in the navigation and in the improvement of the channels,) exhibit a striking contrast in their prospective views of the probable cost of the enterprise.

Comparison of the two sets of proposals for opening channels 300 *feet wide and of different depths in the passes.*

Proposals, &c.	By Craig & Righter	By N. O. Towboat Association.
For channel 18 feet deep in SW. Pass	$125,000	$[illegible]00,000
For channel 20 feet deep in SW. Pass	125,000	325,000
For channel 18 feet deep in Pass à l'Outre	125,000	125,000
For channel 20 feet deep in Pass à l'Outre	125,000	250,000
For a channel 20 feet deep in both passes	250,000	575,000

Hence it appears that no discrimination on account of different depths of channel was made by Messrs. Craig & Righter in either of the passes, while their more experienced competitors provided for a difference of $125,000 between the probable cost of opening a channel 18 feet deep and that of opening a channel 20 feet deep in both passes.

The accompanying sketch drawn by my civil assistant H. C. Long, will show the relative position of the wing-dam, the line of triangulations, sundry soundings at and near the mouth of the SW. Pass, and various other objects embraced within the limits of the sketch and including several bayous, swamps, mud lumps, &c.

In further explanation of the sketch, the following particulars should be distinctly noticed, viz:

The scale of projection is $6\frac{1}{4}$ inches to the mile.

A. B. The prime base 1,000 feet long as measured along the line of piles and embracing nearly the entire length of the dam as it existed at the time of the survey.

B. C. The secondary base 7,800 feet long extending from the lower

end of the prime base A B across the channel of the pass to the light-house C.

The other stations of the triangulations several of which were planted on mere mud lumps rising 8 or 10 feet above the surface of the water, and some of which as at G I and K have been since washed away, are indicated with sufficient clearness on the sketch. The distances on the lines were for the most part computed by logarithms, while the residue were determined geometrically.

With the exception of the prime base, all other lines of the triangulations are indicated in the sketch by broken right lines.

The principal lines of soundings are those leading across the main channel of the pass in which the soundings were repeated as often as the weather would permit, and are represented in the sketch by the lines BC, BE, BF, and FE, EG, GH, HI, HK and JK, the computed lengths of which are exhibited in the tabulation under the title of the sketch.

The soundings recorded along the lines above mentioned, as also those scattered over other parts of the sketch, indicate the depths in feet below the surface of ordinary low tide.

The light wavy lines, *a b* and *c d*, represent the boundaries of the deepest channel across the tidal bar, the depths of which are indicated by a series of soundings in the direction of the channel from the depth of twenty feet at the upper margin of the bar to the deep water of the Gulf. This channel is divided into two subordinate channels near the Gulf, by a narrow spit of indurated mud, called the Middle Ground, as indicated by the dotted lines *e f*, over which the water has a depth of only thirteen feet. A similar spit or middle ground, of the same depth below the water surface, but of much greater extent, occurs at the can buoy, which serves as a beacon to mark its locality. A formidable mud lump, called the East Breaker, occurs at the immediate outlet of the easterly channel into the Gulf, and has a low tide depth of only about seven feet upon it. Several other shoals are indicated on other parts of the sketch by dotted wavy lines, and the depths of water upon them are indicated by figures inscribed along and within the lines.

The new channel to be opened is expected to be formed in the space situated between the wavy lines *a c* and *b d*, before mentioned, the excavations for which must be carried through a distance of about two and a half miles. The quantity of silt, including hard and soft mud, that must be removed, in order to open a channel 300 feet wide and 20 feet deep, will amount to about 460,000 cubic yards; whereas if the depth be limited to 18 feet, the quantity to be removed will be about 175,000 cubic yards, the length of the excavations being about two and a half miles in the former, and only one mile and a half in the latter case.

In all other respects the representations on the sketch are sufficiently intelligible without further explanation.

Moreover, in addition to the sketch, two sets of diagrams are herewith submitted, one of which exhibits monthly soundings on the line of the secondary base leading from a point about midway of the dam across the main channel of the pass to the light-house, and the other

from the same point obliquely downward to the can-buoy, and thence to Stake island; crossing the main channel as above at a point about one mile and a quarter below the intersection of the channel by the line first mentioned. Among the numerous soundings that have been made in connexion with the lines of triangulation and at other places, I have selected the sets mentioned as better adapted to illustrate the changes that have taken place in the bed of the pass, during the months to which they relate, than any other selection that could be made. In further vindication of the selection, it should be observed the line first mentioned crosses the channel at a point where the dam could not be expected to have any influence upon the channel while the other line crosses the channel at a point where the influence of the dam would be likely to have a more sensible effect upon the channel than at any other point.

An inspection of the diagrams will show that the changes that have taken place in the channel during the eight months to which the diagrams relate are very inconsiderable, especially in so far as they relate to the volume and depth of the water; and the slight changes observable may be attributed to the influence of violent winds and storms and other accidents rather than to that of the structure formed for the improvement of the channel.

In reference to the diagrams it should be remarked that their originals were prepared by Wm. Johnson, esq., employed as a supervisor of the pass, &c., and that the same were transcribed by my assistant, H. C. Long; also that, owing mainly to the great irregularity of the ebbing and flowing of the tides, (which occur only once a day,) no minute discrimination has been made with respect to the particular stages at which the soundings were made.

With respect to the tides at the mouths of the Mississippi, they are very irregular and quite anomalous. Their daily ebb and flow occur only once in about 25 hours and 19 minutes; their ordinary range from low to high tide in continued still weather varying from 15 to 18 inches. Their extreme range from the lowest to the highest tides, in stormy or windy weather, is about four feet, the range being increased according to the violence of the winds as they alternately blow from the northward or from the southward. According to the best information that can be obtained, the elevation of the surface at "ordinary low water" is nearly or quite coincident with that of mean tide, the low water ranges rising above the stage of tide about as often as it falls below the same stage.

The report of Mr. Johnson, explanatory of his proceedings at the Southwest Pass under my directions, contains his views in reference to the progress and condition of the work of Messrs. Craig & Righter; to the difficulties and delays attending its prosecution, and to the changes that have occurred in the bed and channels of the pass during the period of his supervision.

The following is a copy of the report:

SOUTHWEST PASS, *December* 10, 1857.

SIR: I have the honor to report that since the 13th of April last I have remained at the Southwest Pass of the Mississippi river in the supervision of the operations of Messrs. Craig & Righter, and the

effects produced by them upon the tidal bar at this pass in pursuance of the instructions in your letter to me, of the date aforsaid. contained.

The scheme of triangulation, as prescribed by you, I have endeavored to carry out to the fullest extent practicable with the limited facilities that were at hand. A base line of 1000 feet was measured upon the jettee dam of the contractors, from which I was enabled to form a secondary base of over one and a half miles, with a direction entirely across the pass, and upon which my subsequent triangulations were based. In running these lines with a sextant corrected by theodolite, I took care to locate them in such a manner that their general direction was across the current and line of the pass, and so that the whole scope of the tidal bar was embraced within their limits. It is unnecessary for me to detail the different lines, &c., as the same are all located and designated upon the plot of triangulated sounding lines now in your possession.

These various lines which cross the main ship channels in many different places, it has been my duty, under your orders of April 18, to sound constantly during the past summer and fall, to plot the soundings thus taken upon cross section profiles, and to report to you any changes or alteration in the bed of the river which could be attributed to the direct agency of the contractors' work. I have the honor to inform you in relation to the frequency of sounding, that I have executed the same as often as practicable under the existing circumstances, but I have been much hindered and retarded in the execution of this duty during the spring by dense fogs, and during the late summer and fall months by the frequent occurrence of heavy squalls and gales of wind.

In relation to any changes developed by those soundings that have taken place on the tidal bar of this pass, attributable as an effect of the works erected by Messrs. Craig & Righter, I am sorry to inform you that, as far as the ship channels are concerned, no beneficial results are observable. True it is that changes have taken place, both in depth of water and in direction of current at various points, but these have in no way affected the ordinary channels of navigation.

The bottom of the river upon the line B F has been gradually wearing away, and the water has consequently deepened; and upon both sides of the island, upon which the point E is located, small channels with eleven feet of water, (where there used only to be two and a half feet,) running thence in a due west direction, have made their appearance. Another fact worthy of mention, which has been developed since the construction of the jettee dam, and in my opinion attributable to its influences, is the strongly increased current with a westerly direction across the bar. So strong has been this current that it has formed a subject of complaint with the pilots, tow-boatmen and others engaged in the navigation of the bar, who remark upon the great difficulty of keeping inward-bound ships in the proper channels. This change in current is, in my opinion, attributable to the inclination and direction the water receives after coming in contact with the jettee dam; and I further believe that after a corresponding work is

erected upon the west shore, as contemplated by the contractors, the current will again resume its proper course.

Behind the dam and until the islands to the eastward are passed no current of any description is to be found, the water is perfectly stagnant, and, in consequence, precipitation is rapidly going on, the water having shoaled nearly two feet since my residence here.

The difference of level between the water on the north and south side of the structure at dead low ebb tide during calm weather is equal to about three inches; at full flood tide and low river no difference is perceptible.

These are the only changes and effects attributable to the contractors' operations which have come under my notice during the past seven months.

In regard to the works themselves, I have the honor to inform you that since the date of your last inspection, in April last, the strength and stability of the dam has been much augmented by the placing of string pieces and supporting piles on the north side of the structure as well as upon the south. There is a slight difference in the manner of driving the up-river posts from that of the down stream piles. They are set at an angle outward on the bottom of about 5°, and the sharp end beveled in such a manner that when driven the head of the pile sets firmly against the string piece and is then firmly bolted through. By this means the strength of the dam is nearly doubled, and I am happy to inform you that all that portion of the work that was originally constructed in this manner has stood unshaken all the heavy gales that have prevailed during the fall.

The contractors have been much troubled in the driving of any permanent work at the north or upper end of the dam. For about 1,500 feet from the marsh the bottom is composed of yellow sand indurated with clay, and in some spots of sand alone. The driving of the pile in these places is a matter of much difficulty, and when driven they have a tendency to work up and out of place, and upon the smallest aperture or opening being developed, the current immediately commences to wash away the surrounding sand and in an incredibly short space of time it will excavate below the bottom of the piles in the immediate vicinity of the old cranny and the work thus affected will, during the first gale thereafter, wash up and be drifted out to sea.

In this section of the work I have known the current at one of those apertures to excavate from two to sixteen feet in forty-eight hours.

Several breaches of this character have occurred during the last six months, have been as often repaired, and spite of every precaution still continue to break out anew. With the exception of this division of the line the balance of the dam, over 4,000 feet, (the whole length of the dam being 5,733 feet,) is driven in a blue clay bottom with a depth of from seven to fifteen feet, below which an indurated bed of white sand is found with an average thickness of some ten feet, below which again lie strata of yellow clay to an indefinite depth. The work driven in this bottom is now standing in perfect order, has

remained so since the date of its construction, is unshaken, and, in my opinion, is unshakeable, except by the power of some irresistable tornado or the more insidious effect of the Gulf-worm.

I am happy to inform you, however, that I have in vain sought for some trace of this animal in wood planted in the water last February, and which has been submerged ever since up to this date.

During the past six months the contractors have had two pile drivers in operation for the majority of the time, with an effective force of from sixteen to thirty men. They have, however, during the past three months been much retarded in their operations by the unusual prevalence of heavy gales which, exposed as they are to the force of the Gulf wave rendered such a thing as active work an impossibility.

I feel myself safe in asserting that, during the time referred to, they have not been enabled to work their boats to any advantage more than three weeks.

In pursuance of your orders I also instituted a course of tidal observations with a view to determine the level of ordinary or mean low tide at this pass. I caused three tide gauges to be constructed, and located the same at different points on the bar and above; the water recorded on each was daily noted, together with the direction of the wind during the past twenty-four hours and its approximate velocity. By taking the sum of these observations and dividing by the number of observations made I obtained the mean low water for the past six months, which level I have permanently located upon a solid bench mark at the west shore some distance above the bar.

WM. JOHNSON,
Supervisor.

Lieut. Col. S. H. LONG, *U. S. A.*

Hence it appears from my own personal inspection, as well as from the observations and statements of Mr. Johnson, that the operations of Messrs. Craig & Righter have hitherto produced no favorable results in so far as relates to the widening and deepening of the channel of navigation across the bar at the mouth of the Southwest Pass.

The agency that appears to have been relied on by the contractors, as the means of accomplishing the objects of their contracts, seems to consist mainly, if not exclusively, in the production of an accelerated current of sufficient speed and force to remove the obstructions and sweep out a channel of the required width and depth.

The accomplishment of the object in this way, seems to involve numerous insurmountable difficulties, many of which have already been noticed on this and former occasions. One of the difficulties, however, which has not yet been mentioned, is entitled to some consideration at this time, and will be treated of in the following manner:

No acceleration of the currents can be produced without an increased elevation of the surface of the pool from which they flow. Any elevation of the surface of the pool formed above the dams or jetties constructed at or near the mouth of the passes, will contribute to give an increased elevation of the surface of the pass at all points

between its mouth and its head, diminishing of course, as we recede from the pool mentioned, towards the head of the pass. Accordingly, an increased elevation would be imparted to the entire water surface of the pass, and this would contribute to increase the outflow, not only through all the bayous on both sides of the pass, but through all of the more easterly passes themselves, while it would also contribute to reduce the volume of water that would otherwise flow into the Gulf below the pool. Hence the means in question would not only prove futile, but would eventually contribute to increase the evil which it is designed to cure.

The difficulty above considered may be readily obviated by adopting and applying the process of dredging the channel across the bar, which would have a tendency not only to enlarge the volume of water, but to accelerate its speed in its passage through the channel to the Gulf.

In conclusion I take leave to advert to the inadequacy of the present light-house at C, on the sketch, to subserve the purposes for which it was intended. Without intending to enlarge on the defects of its position or structure, I venture to suggest a substitute which would cost less and answer better purposes. Instead of the single light-house I would propose the construction of two light-boats with a light on each, elevated some 30 or 40 feet above their decks. One of the boats should be suitably anchored near or a little above the can-buoy, and the other about a mile further up the pass, and in such a position that a right line passing from its light to the main outlet of the pass into the Gulf, will also pass through the light of the first or lower boat. The lights being thus situated a vessel in the Gulf bound in the mouth of the pass may pursue her course till she arrives at the range line of the lights, when she may shift her course and pursue her voyage in safety along the line and across the bar till she reaches safe anchorage in the pass. Should the channel undergo a change, (and such a change is continually in progress,) a corresponding change may readily be made in the relative position of the lights, by changing the anchorage of the boats, and thus the lights may be made to serve as safe and sure guides to vessels and especially to steamers desirous of entering the pass by night, whenever the lights are visible from on board.

S. H. LONG,
Lieutenant Colonel Topographical Engineers.

Colonel J. J. ABERT.

APPENDIX—Doc. No. 5.

NEW ORLEANS, *May* 31, 1858.

SIR: During the last four weeks I have been almost constantly occupied in the inspection of the passes of the Mississippi and of the

works in progress for the removol of the obstructions therefrom. I now take leave to report the results of my observations and enquiries relating to these subjects.

Since my inspection in April and November, 1857, manifest changes have occurred in the depths of the channels leading across the tidal bars at the mouths both of the Southwest Pass and of the Pass à l'Outre. The depths in both passes have increased very materially since the dates of these inspections, as will be shown in tabular synopsies hereinafter to be presented. The cause of these changes cannot be demonstrated with any degree of certainty. Those in the Southwest Pass may be attributed, in part, to the agency of the pile wing-dam constructed by Messrs. Craig & Righter, while those in the Pass à' l'Outre cannot have been produced in any degree by a similar cause, for they no doubt occurred prior to the commencement of operations in this pass by the contractors above named.

The following synopsis will indicate the nature and extent of the more material changes that have taken place since November last:

Abstract of Soundings in Channel of Southwest Pass.

November, 1857.—18, 16, 17, 17, 17, 17, 17, 16, 16, 15, 15, 15, 16, 16, 16, 16, 16, 16, 15, 15, 15, 15.

May, 1858.—19, 19, 20, 21, 21, 21, 21, 22, 21, 20, 21, 20, 19, 20, 22, 21, 22, 22, 22, 21, 21, 21.

November, 1857.—16, 16, 16, 16, 16, 16, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 16, 16, 16.

May, 1858.—21, 20, 20, 19, 20, 19, 18, 18, 19, 19, 19, 17, 18, 18, 19, 19, 18, 19, 19, 18, 19.

November, 1857.—15, 15, 15, 15, 16, 16, 16, 16, 16, 15, 15, 15, 15, 15, 16, 16, 17, 18, 19, 20.

May, 1858.—19, 19, 19, 20, 19, 19, 19, 19, 18, 18, 19, 19, 19, 20, 20, 18, 19, 19, 19, 20.

The soundings of the synopsis were made in the deepest channel of the pass, and through a distance of about 1¼ miles from the site of the can-buoy to the margin of the Gulf; but without any special regard to its width, direction, or straightness of course. On arriving at the crest of the tidal bar, about 200 yards from the Gulf, the main channel is divided into two narrow, subordinate channels, respectively, of about equal capacity—one about 200 feet wide, running to the right or westward, and the other about 150 feet wide, to the left or eastward—which are separated from each other by a bar called the *middle ground*, composed of sundry mud lumps, which divide the channels one from the other, and on which the depths of water vary from 17 to 13 feet only. These obstructions cause the subordinate channels to diverge from each other at a point about 50 yards above the middle ground, and the deflections occasioned thereby divert both of these channels from the requisite right-line channel leading across the bar.

The head of the middle ground, as just intimated, is situated about

50 yards below the crest of the bar. The width of the main channel, as measured along the crest, is about 500 feet; and the soundings of the crest, or across the narrowest part of the channel, beginning on the west and terminating on the east side of the channel, at depths of 15 feet below the surface of low water, are as follows, viz: 15, 18, 21, 20, 19, 19, 21, 21, 20, 21, 21, 18, 18, 17, 16, 15 feet.

From the various soundings given as above, and from other observations, it is pretty evident that vessels drawing 18 feet can pass freely across the tidal bar, whether outward or inward bound, without infringing against the bottom of the channel; but they cannot pursue a straight course to or from the Gulf, by reason of the middle ground, and other obstructions. Moreover, the channels on both sides of the middle ground are quite narrow, neither of them being more than 200 feet in width.

In view of the foregoing considerations, it is apparent that the upper portion of the channel across the tidal bar through a distance of about one and a quarter miles, viz: from the can-buoy downward to the crest of the bar, requires widening and deepening in a very few places only, in order to answer the condition of the modified contract of Messrs. Craig & Righter in so far as relates to the *opening* of the channel of the Southwest Pass.

The *opening* of the residue of the channel *in* from the crest of the tidal bar to the margin of the Gulf, about two hundred yards only, in conformity to the stipulations of the contract which calls for a channel three hundred feet wide and eighteen feet deep, leading in a straight direction across the entire bar to the deep water of the Gulf, will require the reduction and removal of the middle ground, &c., described as above, to the depth of eighteen feet.

In connexion with the changes indicated by the soundings, &c., exhibited in the foregoing remarks, other changes and occurrences have taken place since my inspection of April and November of 1857.

The principal changes, &c., last mentioned are briefly as follows:

1st. The channel across the immediate crest of the bar has been transferred a considerable distance to the westward of the position occupied by it in the spring of 1857.

2d. A mud lump on the easterly side of the old channel which previously had a depth of eight feet on its summit has risen to the height of about seven feet above the surface of the water.

3d. A mud lump near the westerly side of the contemplated new straight channel, and about one hundred and twenty yards below the crest of the bar, in April, 1857, had a depth of ten feet on its summit, but at the present time has a depth of only six feet, and appears to be still rising.

4th. The old east channel leading across the line of the pile dam, and tending southeastward to the Gulf, had a depth of about eight and a half feet across the bar in 1857, and the water upon it has now only about half that depth. This change has obviously been produced in part, if not entirely, by the pile dam, which has undoubtedly contributed to increase the volume of water passing downward in the main channel of the pass.

5th. The main channel in its passage across the entire tidal bar from the can-buoy gulfward has been gradually moving westward during the last year.

6th. In February last the old can-buoy (a hollow cylinder made of boiler iron anchored at the head of a shoal in the channel) was accidentally displaced and lost in the Gulf. A similar buoy, &c., has since been procured by Captain Simms, of the navy, and substituted for the lost buoy, in a position about one hundred feet from that previously occupied by the latter.

7th. Within the last year about two-thirds of the upper part of the pile dam, viz: from the point A (see chart accompanying my inspection report of December last) to the edge of the marsh, above fifteen hundred feet have been demolished. The lower portion of the dam from A to its lower end, four thousand two hundred and twenty-three feet, has been ruptured in no less than six places by breaches, varying from ten to one hundred and fifty feet in width. Notwithstanding the occurrence of these breaches, the structure, while unimpaired, contributed to check the current through the old east channel, mentioned in the fourth item as above, and evidently occasioned the accumulations of mud in its wake, thus reducing the depth of water in that channel.

8th. Since the date of my inspection report of December last nothing has been done towards extending the pile dams or forming new ones at the Southwest Pass. The water craft and other apparatus employed by the contractors remain as then reported. In March last the craft, &c., just mentioned were removed from the Southwest Pass, and are now employed in the construction of a pile dam in Pas à l'Outre.

9th. The craft and machinery lately introduced into the Southwest Pass for the purpose of deepening and widening the channel consists of a large steam-tug called the Downs, formerly employed as a tow boat, one mud scow, one yawl, and one skiff. The machinery, exclusive of the steam-engine, boilers, &c., belonging to the boat, consists of two cast-iron harrows with scrapers, (one of which has been lost in the pass in consequence of the breaking of the chains with which it was manœuvered,) one set of dredging apparatus, consisting of two semi-circular buckets of a capacity to contain three cubic yards in both, together with a large beam to which the buckets are attached, chains and other tackle, anchors, &c., adapted to the working of the boat and machinery.

When in fair and full operation the buckets are lifted to the surface of the water charged to overflowing with compact mud scooped from the mud lumps at the bottom of the channel. The excavated mud is so compact and adhesive that it will often remain in the buckets, even when their discharging hatches are open, till they rise to the surface of the water. The dredging done in this way, all things being favorable, amounts to three cubic yards in six to eight minutes, or about twenty-five and a half cubic yards per hour.

10th. Variable currents leading across the bar, and especially their great rapidity during the lower stages of the tide, render it extremely

difficult to guide a steamer or even a yawl to the points where dredging is required. The successive steps to be taken in prosecuting the work of dredging are: 1st, to discover the point, position, or mud lump at which dredging must be done; 2d, to anchor the dredge-boat at a proper distance above the place to be dredged, with a length of cable sufficient to allow the boat to drop below the place; 3d, to dredge upward, or against the current till the dredge buckets are filled; and lastly, to drop above the place of dredging and empty the buckets in deep water.

11th. The following manner of operation has been found equally as efficacious, viz: to anchor the boat as before, and then dredge with open buckets, cutting away the tops of the mud lumps, &c.

12th. The method of reducing the mud lumps by the use of a massive harrow of cast iron, armed with teeth on its sides and a scraper at its aft transom, was tried successfully for about two weeks, but accidentally the drag chains by which it was worked parted, and the harrow was lost in the pass.

13th. The dredge buckets were substituted instead of the harrow, after the accident above noticed, and proved more manageable and efficacious in scalping the mud lumps than the harrow.

On the 7th instant, and under a conviction that the condition of the Southwest Pass justified the proceeding, I prepared and forwarded to the bureau a brief report, of which the following is a copy, viz:

SOUTHWEST PASS, *May* 7, 1858.

SIR: Having very recently inspected the work done at this pass, under the modified contract of Messrs. Craig & Righter for the removal of obstructions therefrom, I have the honor to report briefly thereon as follows, viz:

The dredge-boat Downs, previously used as a tow-boat on the Mississippi below New Orleans, was procured and furnished with appropriate dredging apparatus, consisting of harrows, scrapers, rakes, &c., &c., all of approved dimensions and construction, in the months of February and March last.

The outfit as above having been completed, the boat commenced operations on the tidal bar on the 22d day of March last, and continued to operate successfully during a period of about three weeks, with occasional interruptions and hindrances by boisterous weather.

The operations have been continued with similar success, and even to greater advantage than had been anticipated to the present time, the interruptions and hindrances by stresses of weather having been more frequent and formidable than before during the last three weeks.

In addition to the employment of the boat and dredging apparatus as above, the blasting of the mud lumps at the bottom of the channel with heavy charges of powder has been successfully tried, and the results produced thereby are highly satisfactory.

In view of the whole case, I am decidedly of the opinion that the measure of relief contemplated in my report to the bureau of the 25th of February last may be fairly extended to the contractors, to wit:

the payment of $30,000 as the first instalment therein contemplated to be paid; and although the time for the payment of the second instalment of $36,000 has not yet elapsed, I am moreover of the opinion, in view of the advancement made towards the fulfilment of the first branch of the contract, viz: the *opening* of the channel, that this latter installment may also be paid without detriment to the United States.

S. H. LONG,
Lieutenant Colonel, Top. Eng.

Colonel J. J. ABERT.

P. S. It is expected that the work under the first branch of the contract for the Southwest Pass, or the preli ninry stipulations relating to the opening of the channel in this pass, will be ready for final inspection in the course of a few weeks, the weather continuing favorable.

S. H. LONG, *U. S. A.*

The mud lumps, which are the most serious and formidable obstructions in the way of navigation, invariably rise and present themselves at or about the surface of the water, along the crest of the tidal bar, or between the crest and the open Gulf. In consequence the outflow of the Mississippi passes off through the openings between the lumps in greater or less volume, according to the width and depth of the openings. Hence the multiplicity of the passes through which the waters of the Mississippi are discharged.

The lumps are commenced and continue to rise so long as the matter gases, &c., confined beneath their crusts or coverings retain a specific gravity less than that of the water by which they are surrounded, and emit salt water, fine mud, gases, &c., at their summits, till the supplies of these light and levigated materials are exhausted, after which the lumps gradually subside and become components in part of the marshy grounds through which the several passes convey their waters.

By cutting away the summits of the lumps and reducing the thickness of their crusty coverings, the discharge of the light materials and the reduction of their substance are materially accelerated.

The process of blasting with heavy charges of gunpowder (50 to 160 or 200 pounds to the charge,) has been tried, and the result produced has been very satisfactory. A torpedo charged with fifty pounds of powder has been exploded at a formidable mud lump on the easterly side of the channel near the margin of the Gulf, which, after reducing the lump, occasioned a copious and violent ebullition of gases &c., which continued at least twenty minutes from and after the explosion.

The experiment as above would have been repeated, but the unfavorable state of the weather and other untoward circumstances have prevented the repetition. This mode of operating upon the mud lumps and upon the hard bars, not only of the Southwest Pass, but upon those of Pass à l'Outre, is intended to be introduced generally,

and is relied upon as the most effectual and economical means of removing the obstructions occasioned by impediments of this sort.

The examinations of the Southwest Pass were conducted by the aid of numerous line soundings in the direction and within the limits of the proposed new channel; and still many more random soundings were made within and at the sides of the same channel. The soundings were as follows, viz:

On the 7th May two lines were sounded along the centre of the channel from the can-buoy to the Gulf, the depths varying from 23 to 18 feet.

On the 8th, the force on the dredge-boat was employed in repairing an accident which occasioned the breaking of the hoisting chains of the dredging apparatus. A stronger chain was substituted. In the meantime Captain Johnson with his boatmen and skiff, aided me in making numerous random soundings in the extensive water field situated above the crest of the tidal bar, the depths ranging from 22 to 2 feet.

On the 9th, this being Sunday, and the weather stormy, nothing was done on the work.

On the 10th, the weather continued windy and rainy through the day; operations were again suspended.

On the 11th, made numerous random soundings on the bar and middle ground between the crest and the Gulf, and for the most part within the channel way, the depths varying from 26 to 15½ feet.

On the 12th, sounded across the channel at the crest of the bar, the depths varying from 19½ to 17½ feet. The most formidable obstructions in the channel way are included within an area of 100 by 200 yards, embracing the middle ground and situated between the crest and the Gulf. Within this area are four mud-lumps partially reduced, which are the only obstructions to be removed. On the same day made two series of line soundings, and numerous random soundings below the crest in the channel-way, the depths of the latter varying from 27 to 17 feet.

On the 13th, made four series of line soundings, the depths varying from 22 to 18 feet; also numerous random soundings between the can-buoy and the crest, and between the crest and the Gulf, the results being similar to those of the 11th and 12th.

On the 14th, made two series of line soundings, the depth in almost every instance exceeding 18 feet.

On the 15th, made two series of line soundings, the results continuing equally favorable; also numerous random soundings on the middle ground and in range, the results gradually becoming more favorable.

On the 16th and 17th, the weather being unfavorable for work in the Southwest Pass, we proceeded to Pass à l'Outre and returned.

On the 18th, I proceeded to New Orleans for some time.

On the 25th, I returned to the Southwest Pass and resumed my examinations. Made four series of line soundings in the channel between the can-buoy and the Gulf, the depths varying from 22 to 17 feet, and obviously becoming more favorable [illegible]

made more than 300 random soundings in the new channel-way below the crest of the bar.

On the 26*th*, made two series of line soundings 300 feet apart, for the purpose of determining the width of the channel and its depth at the sides thereof, the depth at the sides varying from 22 to 17 feet. These soundings did not appear sufficiently reliable, by reason of deviations from the channel occasioned by the force of the wind, the passing of tow-boats, and the action of water currents. We also made, the same day, more than 130 soundings in the channel-way below the crest of the bar, the depths varying from 26 to 17½ feet, and the weather continuing unfavorable through the day.

On the 27*th*, the weather continuing rainy and somewhat boisterous, we proceeded to Pass à l'Outre and returned. In the afternoon the weather becoming more favorable, we resumed our measurements of the width and depth of the channel, but were again unsuccessful, being interrupted by the passage of tow-boats and the roughness of the water below the crest of the bar. The results obtained were similar to those of yesterday. Many random soundings were also made this day.

On the 28*th*, repeated the line soundings for determining the width of the channel, the weather being more favorable, and the observations being more carefully made than those of the two preceding days; the results of these line soundings will be presented in the sequel under the head of "Final Inspection of the Channel," &c. Moreover, we made 595 random soundings in the channel-way at and below the crest of the bar, the depths varying from 25 to 18 feet, the tide at the time being about three inches below the surface of ordinary low water.

I have the honor now to report, that on a thorough inspection of the channel, and of the work done under the modified contract of Messrs. Craig & Righter, for the removal of obstructions from the mouth of the Southwest Pass, made and concluded on the 28th day of May, 1858, a straight channel has been opened entirely across the tidal bar, having a width of at least 300 feet, and a depth of 18 to 22 feet. The direction of the channel, from its head near the can-buoy to its entrance into the deep water of the Gulf, is south 25° west.

The opening of the channel has undoubtedly been effected in part by the work that has been done under the contract, and in part by the agency of the water currents in the pass, and by other natural causes. Hence, in accordance with the stipulations of the modified contract, in so far as they relate to the *opening* of the channel in the Southwest Pass, the compensation to be made for the opening thereof, viz: one hundred and twenty-five thousand dollars, ($125,000,) all payments being included, is now payable to the contractors.

Moreover, the first branch of the contract being fulfilled as above, the stipulations for *keeping open* the channel, as provided for in the same contract, will go into operation and remain binding on the contractors, from and after the 28th day of May, 1858.

All proper and necessary details relating not only to the accom-

plishment of the first object or branch of the modified contract of Craig & Righter, for the Southwest Pass, but also to the work done towards the accomplishment of a similar object of their modified contract for Pass à l'Outre, will be exhibited in the subjoined supplement, which is as follows:

Final Inspection of the Channel of the Southwest Pass, as opened under the modified contract of Messrs. Craig & Righter, in a straight direction (viz: S. 45° W.) from the can-buoy, across the tidal bar to the open Gulf, agreeably to said contract.

Having made numerous line soundings within the channel, and countless random soundings within and near said channel, the latter having for the most part been made, between the crest of the tidal bar and the open Gulf, within an area of three hundred feet in width by six hundred in length, we proceeded to the execution of more careful soundings, and other observations, for determining the width and depth of the channel opened as above, in fulfilment of the first branch of the contract, which relates exclusively to the opening of said channel.

The means and appliances employed in determining the width and depth of the opened channel, were as follows, viz:

1. The steamer Downs, which was conducted downward in the centre of the channel, floating with the current.

2. Two skiffs, manned with two oarsmen and an experienced leadsman in each, floating downward, *pari passu* with the steamer, and connected with the latter by a line 300 feet long stretching across its bow, and kept straight and above the surface of the water, by moving the skiffs outward and downward in a manner to keep the line *taut* and square across the steamer.

3. The leadsmen were required to sound at both extremities of the line, and to call out the soundings with a loud and distinct voice.

4. The soundings thus proclaimed were at once recorded in a note book kept by Captain William Johnson, my acting assistant.

These operations were commenced on the 27th instant, but the results proved unsatisfactory by reason of a strong breeze, by which the surface of the pass was too much ruffled to admit of reliable observations.

On the 28th, the day following, the operation was resumed the weather and other circumstances being much more favorable than before. The results on both occasions were similar, but those obtained on this day were far more reliable. The latter are presented in the following synopsis:

Soundings at the easterly and westerly margin of the improved channel.

Easterly margin—
18, 18, 18, 18, 19, 19, 18, 19, 19, 18, 19, 18, 19, 19, 19, 19, 19.
Westerly margin—
19, 19, —. —, 19, 19, 19, 19, 19, 19, 19, 19, 19, —, 19, 19, 19.
Easterly margin—
19, 20, 19, 19, 19, 19, 19, 20, 20, 20, 21, 21, 21, 20, 22, 21, 22, 22.

Westerly margin—
19, 19, 19, 19, 19, 19, 19, —, 19, 19, 19, 18, 18, 19, 19, 19, 19, 18.
Easterly margin—
23, 21, 21, 20, 21, 20, 21, 21, 19, 20, 20, 21, 21, 21, 21, 21, 20, 19, 19, 18, 22, 26 ft.
Westerly margin—
19, —, 19, 19, 19, 19, 19, 19, 19, 19, 18, 19, 18, 18, 18, —, 19, 19, 23, 24, 18, 24 ft.

In order to verify the accuracy of the four sets of soundings presented near the end of the tabulation, which were much affected by the gulf billows, more than 500 random soundings were made with the utmost care within and along the margins of the channel, (and all within the limited area of 300 by 600 feet, which embraces the sites of the four mud lumps before mentioned, all of which have been reduced by the agency of the bucket scrapers of the Downs,) for the purpose above mentioned, viz: the verification of the accuracy of the channel soundings. The random soundings just mentioned varied from 28 to 18 feet; no depth indicated thereby being less than 18 feet.

The stage of water at which the soundings as above were made, was as nearly as it was practicable to judge, about three inches below mid-lunar tides, (viz: tides unaffected by winds.) This stage is rather below "ordinary low water," as inferred from a protracted series of observations by tide gauges prepared under my direction.

Hence, I have come to the conclusion that a straight channel 300 feet wide, and 18 feet deep, is now open entirely across the tidal bar of the Southwest Pass to the open Gulf, and that the stipulated payment of $125,000, agreeably to the modified contract of Messrs. Craig & Righter for opening said channel is now due to them jointly, as one of the parties of said contract.

I have also come to the conclusion that the other branch of the contract which relates to the *keeping open* of the said channel in the Southwest Pass is in operation and binding on the above named contractors, from and after the 28th day of May, 1858.

Inspection of Pass à l' Outre and of the work done thereat towards the improvement of its channel. Abstract of soundings in channel of Pass à l' Outre.

April, 1857.——————16——————15————14.
May, 1857.—18, 18, 17, 17, 17, 17, 17, 18, 16, 17, 18, 17, 17, 16, 17, 17, 17, 17, 16.
April, 1857.———13————12——————12———12.
May, 1858.—15, 15, 16, 16, 16, 15, 16, 17, 16, 16, 16, 15, 16, 17, 17, 16, 15, 16, 15 16.
April, 1857.————13——12——14————18————feet.
May, 1858.—17, 16, 16, 15, 15, 18, 16, 18, 19, 18, 19, 20, 23, 24 feet.

The channel soundings made in May as above, were commenced at a point a few hundred feet below the Pass à l'Outre light-house, and continued thence downward about 1¼ miles to the open Gulf. No continuous soundings were made in the channel in April, 1857, while

those exhibited in the tabular synopsis are taken from mere random soundings made on the tidal bar in that month. The soundings thus made have been inserted as nearly as practicable in a manner to coincide with the soundings of the current month, which have been selected from four distinct lines of soundings.

The main channel trends downward in a direction about S. 85° E. by the compass. That portion of it requiring improvement passes over a broad shoal on which the present depth of water is nowhere less than fifteen feet, except on a spit or sort of middle ground of considerable size, the head of which is about one hundred yards from the Gulf, and on which the depth in places does not exceed twelve feet. The channel to be improved may pass either on the northerly or southerly side of the spit without materially affecting the course above given; or it may pass through the spit, should the contractors, on a careful examination, prefer to open the channel by this route.

As before intimated, the distance through which, under existing circumstances, the opening of the channel must be carried, is about half a mile, and the excavations required therefor will amount to about fifty thousand cubic yards. Hence, the work remaining to be done in this pass under the modified contract will undoubtedly occupy a much longer period than that allowed for its fulfilment.

The head of the channel to be opened commences about six hundred yards below the light-house, and extends downward across the tidal bar to the deep water of the Gulf, through the distance of about 1¼ miles, as above stated. Between the light-house and the head of the new channel, or commencement of the tidal bar, the old channel is some eight or nine hundred feet wide, and has a depth everywhere exceeding eighteen feet. From this point downward the volume of water from above spreads over a broad shoal, including the middle ground before noticed, (on which last the depth is only twelve feet,) and passes off to the Gulf with the depth indicated by the soundings recorded in the table for the month of May.

Early in April last Messrs. Craig & Righter commenced the formation of a pile dam at a point about one hundred and twenty yards below the light-house, and had extended it at the time of my late inspection, on the 17th instant, through a distance of one hundred yards. Its direction is about S. 70° E., converging towards the main channel at its mouth.

The examination of this pass was repeated on the 27th instant, and line soundings were again made in four distinct series, mostly within or near the route contemplated for the new channel. From these soundings, and from those also made on the 17th instant in the same pass, the following synopsis is prepared, from which it may be perceived that some improvement has taken place in the capacity of the channel within the ten days elapsed as above.

Abstract of soundings made in Pass à l' Outre on the 17th and 27th May, 1858.

May 17, 1858.—18, 18, 17, 17, 17, 17, I7, 18, 16, 17, 18, 17, 17, 16, 17, 17, 17, 17, 16, 15.
May 27, 1858.—19, 18, 18, 17, 18, 18, 17, 18, 17, 17, 17, 16, 17, 17, 17, 17, 17, 17, 17.
May 17, 1858.—15, 16, 16, 16, 15, 16, 17, 16, 16, 16, 15, 16, 17, 17, 16, 15, 16, 15, 16, 17.
May 27, 1858.—17, 17, 17, 16, 15, 16, 17, 17, 17, 17, 15, 16, 17, 17, 16, 16, 16, 18, 17, 17.
May 17, 1858.—16, 16, 15, 15, 18, 16, 18, 19, 18, 19, 19, 23, 24 feet.
May 27, 1858.—16, 17, 15, 16, 17, 16, 18, 18, 18, 18, 19, 21, 23 feet.

The work done on the dam since the 17th instant consists mainly in the repairing of a breach formed at the head of the dam more than one hundred feet in extent. On the 27th the breach appeared to have been thoroughly repaired, and the contractors were about to engage in the further extension of the dam.

In order to expedite the opening of the channel the contractors propose to adopt the method of blasting by the use of torpedos charged with gunpowder. In this way they will be likely to accomplish the object more effectually and economically than by persevering in the construction of pile dams, the utility and especially the stability of which are questions not yet satisfactorily answered.

Agreeably to the statements of the contractors, the materials they now have on hand ready for use consist of 500 square piles, 118,000 superficial feet of plank piling, and 5,000 pounds of iron in bolts and bars.

Their large pile-boat Fanny Fern has been laying by for repairs in the Southwest Pass for more than two weeks, and still remained unemployed on the 28th instant. In the meantime their smaller pile-boat, the Little Fanny, has been daily employed in repairing the breach in the dam.

S. H. LONG,
Lieutenant Colonel Topographical Engineers.

Col. J. J. ABERT.

APPENDIX—Doc. No. 6.

UNITED STATES TOPOGRAPHICAL OFFICE,
St. Louis, September 23, 1858.

SIR: Pursuant to your instructions of the 28th ultimo, received at this place on the 31st of the same month, I embarked for the mouths of the Mississippi on the 2d instant, and arrived at Pass à l'Outre on the 10th instant, and engaged at once in the inspection of the work

done under the contract of Messrs. Craig & Righter for the improvement of the channel across the tidal bar at this pass. The proceedings had in reference to the examinations and inspection of the pass, are briefly as follows, viz:

1st. A double series of line soundings, extending entirely across the tidal bar (about 2,200 yards) to the open Gulf and back again, was made along the improved channel at near and within the limits to which it had been opened. More than 250 soundings in feet were made on this trip.

The following is a synopsis of this double series.

First trip outward—
20, 20, 19, 18, 19, 18, 19, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18.
20, 19, 20, 18; 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18.
First trip outward—
17, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 17, 17, 18.
18, 18, 18, 18, 18, 18, 18, 17, 18, 17, 18, 18, 18, 18, 18, 17.
First trip outward—
17, 17, 18, 17, 17, 16, 17, 17, 17, 17, 18, 17, 17, 18, 18, 20, 20, 21, 22.
17, 16, 17, 16, 17, 16, 16, 16, 16, 16, 16, 15, 16, 17, 17, 21, 22, 25, 22.

N. B.—The soundings less than 18 feet in depth were all outside of the channel way, while many above and below the bar, exceeding 18 feet in depth, are omitted in the synopsis.

Returning on the same trip, from the Gulf to the inner margin of the bar, the double series of soundings were as follows:

First trip return—
22, 21, 20, 19, 18, 18, 18, 18, 18, 18, 19, 19, 18, 18, 18, 18, 19, 19, 19.
22, 21, 20, 19, 20, 19, 19, 18, 18, 19, 19, 18, 19, 19, 19, 18, 18, 19, 19.
First trip return—
19, 19, 19, 19, 19, 19, 19, 18, 19, 19, 19, 18, 18, 19, 18, 19, 18, 18.
19, 19, 19, 19, 19, 19, 19, 19, 19 19, 20, 19, 19, 19, 19, 19, 19, 19.
First trip return—
19, 19, 19, 19, 20, 20, 18, 19, 19, 18, 18, 19, 19, 19, 19, 19, 19.
19, 19, 19, 20, 20, 19, 20, 20, 19, 19. 19, 19, 19, 19, 19, 19, 19.
First trip return—
19, 19, 19, 19, 19, 19, 19, 19, 19, 19, 20.
19, 19, 20, 20, 20, 19, 19, 19, 19, 20, 21.

NOTE.—The outward and return soundings, recorded in the foregoing synopsis, were made when the surface water of the pass was about three inches below ordinary low water.

Our second trip embraced a double series of zigzag soundings, carried alternately to the north and south sides of the new channel, and extending as before entirely across the tidal bar. The number of soundings made being about 400.

The following synopsis exhibits the soundings made on this trip, taken zigzag, or from side to side of the channel in both directions, outward and return:

Second trip outward—
20, 18, 18, 19, 19, 18, 18, 18, 18, 18, 18, 18, 18, 17, 17, 18, 17, 18.
20, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 17, 18, 17, 16, 16, 17, 17.
Second trip outward—
18, 18, 19, 19, 19, 19, 18, 18, 18, 17, 16, 16, 17, 17, 17, 18, 18, 18, 18, 18,
18, 18, 18, 19, 19, 18, 16, 17, 16, 15, 15, 15, 16, 16, 18, 18, 18, 18, 17, 16.
Second trip outward—
18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 17, 18.
18, 18, 17, 17, 18, 18, 17, 17, 17, 16, 16, 16, 17, 17, 17, 17, 17, 17, 16, 16, 16.
Second trip outward—
17, 18, 18, 17, 18, 19, 18, 18, 19, 18, 18, 18, 17, 18, 22, 22, 20, 23, 21, 27.
17, 17, 17, 17, 18, 19, 18, 18, 18, 18, 17, 17, 19, 19, 22, 18, 19, 22, 24, 27.
Second trip return.
19, 22, 21, 24, 24, 23, 21, 23, 22, 21, 23, 18, 18, 19, 20, 21, 22.
19, 20, 22, 23, 22, 22, 22, 22, 22, 21, 23, 18, 19, 19, 22, 18, 22.
Second trip return—
21, 19, 19, 19, 18, 19, 19, 19, 19, 19, 18, 18, 18, 18, 18, 18, 18, 17, 18.
18, 19, 19, 18, 19, 19, 19, 19, 19, 18, 19, 17, 16, 15, 16, 17, 18, 18, 19.
Second trip return—
18, 19, 19, 19, 19, 19, 20, 20, 20, 19, 19, 18, 17, 17, 17, 18, 18, 19.
17, 18, 18, 19, 20, 19, 19, 20, 18, 19, 18, 18, 17, 17, 17, 17, 18, 18.
Second trip return—
18, 18, 18, 19, 19, 20, 19, 19, 20, 19, 19, 19, 19, 19, 19, 18, 18, 17.
18, 18, 19, 19, 19, 19, 19, 21, 19, 19, 19, 19, 19, 19, 18, 18, 18, 18.
Second trip return—
19, 19, 19, 19, 18, 18, 18, 18, 19, 19, 19, 19, 19, 19, 19, 19, 19, 19, 18.
18, 19, 19, 18, 18, 18, 18, 19, 19, 20, 21, 21, 19, 19, 19, 19, 19, 18, 18.
Second trip return—
18, 17, 17, 18, 18, 18, 18, 18, 19, 18, 20, 20, 20, 21, 22.
17, 17, 17, 18, 18, 18, 18, 18, 19, 19, 20, 20, 20, 22, 22.

The soundings in this synopsis may be regarded as random soundings obliquely across the channel between the north and south margins thereof.

The third trip also embraced a double series of line soundings, each series having been made as nearly as practicable in coincidence with the lines bounding the sides of the channel; one of the series being run approximately along the northerly side, and the other along the southerly side of the channel. These soundings in both directions are exhibited in the following synopsis:

Third trip outward—
19, 19, 19, 18, 18, 18, 19, 18, 18, 18, 18, 18, 18, 18, 18, 18, 19, 18, 18.
20, 19, 19, 18, 19, 18, 18, 18, 18, 18, 18, 19, 19, 18, 18, 18, 18, 18, 18.
Third trip outward—
18, 18, 18, 18, 18, 18, 18, 18, 18, 19, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18.
18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18.
Third trip outward—
18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 21, 19, 23, 23.
18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 19, 22, 22, 22.

Third trip return—
19, 18, 19, 19, 19, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18.
19, 19, 19, 19, 18, 18, 18, 18, 19, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18.
Third trip return—
18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18.
18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18.
Third trip return—
18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 19, 19, 19, 19, 19.
18, 18, 18, 18, 18, 18, 18, 19, 19, 18, 18, 19, 19, 19, 19, 20.

The soundings recorded in this synopsis were made on lines fully 300 feet apart at all points, the distances between the lines pretty generally being considerably greater than that just mentioned.

In order to determine the least distance between the lines mentioned, or in other words, the width of the improved channel at its narrowest part, a fourth trip was made across the bar and back again, and a careful measurement was made across the channel at a point where its width was obviously less than at any other point. This measurement was effected by means of small lines stretched across the channel from the steamer Downs, which was anchored midway of the channel, the lines being extended to buoys placed on each side of the channel near its margins. The measurement gave for the width of the channel at its narrowest part at least 325 feet.

From the soundings of the third trip it may be inferred that the average depth of the newly opened channel is considerably more than 18 feet, whereas the average depth of the same channel as inferred from the soundings recorded in my inspection report of June last is about 16 feet. This astonishing and almost incredible change has been effected by the submarine blasting of seventy-four torpedos, and the consumption of nearly eight thousand pounds or four net tons of gun powder.

The torpedos employed (one only of iron being excepted) were made of tin in the form of canisters, and were of three different sizes; the largest containing 156 lbs., the medium 112 lbs., and the smallest 78 lbs., each; of the first or largest class twelve were blasted, of the second or medium class thirty-two, and of the third or smallest class thirty were blasted; the whole quantity of powder consumed being about 8,000 pounds as before stated.

The torpedos were deposited and blasted in depths varying from seven to twenty feet below the water surface. The explosion produced basin shaped cavities at the bottom of the pass, of greater or less dimensions according to the depth of water and the size of the charge exploded. The more conspicuous the effect, and the louder the report of the explosion above water, the less considerable the effect produced at the bottom of the pass.

The skillful and successful management of the blasting was executed by Mr. George L. Baker who fired the first torpedo on the Pot Rock at Hurl Gate, under the direction of Benj. Maillefert, esq., and has served conspicuously and successfully in the operations of that gentleman at that and various other points since the date of that memorable achievement.

The effect of the blasting on the indurated bottom of the pass, consists not only in the formation of basin shaped cavities but in the converting of the indurated and crusty clay bed at the bottom of the channel, into a pasty and yielding consistency, whereby the levigated materials of which it is composed, are disintegrated, set at liberty and wafted away by the water currents. By the same operation the crust at the bottom being extensively ruptured the gases, &c., beneath it are allowed to escape, producing violent ebullitions at the surface of the water, and a subsequent settling or sinking of the indurated bottom, remaining undisturbed by the blast, near and for a greater or less distance around the point of explosion.

The washing away of the detritus thus produced is further promoted and accelerated by the use of massive harrows or scrapers dragged along the bottom after the explosions have been made.

Having completed my inspection of this pass I prepared a brief summary report in relation to the same, of which the following is a copy:

"NEW ORLEANS, *September* 11, 1858.

"SIR: In obedience to instructions from the War Department dated on the 28th, and recieved at St Louis on the 31st of August last, I proceeded to Pass à l'Outre for the purpose of inspecting the work done under the modified contract of Messrs. Craig & Righter, for the removal of obstructions from the mouth thereof, especially in so far as relates to the first branch or object of said contract, viz: to the *opening of a straight channel*, 300 feet wide and 18 feet deep entirely across the tidal bar to the deep water of the Gulf.

"I now have the power to report briefly and summarily the results of my investigations measurements, &c., in reference to the subjects proposed and to the conclusions to which I have arrived.

"A straight channel leading in a direction about S. 85° E., or N. 85° W., having a width nowhere less than three hundred (300) feet and a depth of at least eighteen (18) feet below the surface of ordinary low water, has been opened and now exists at and entirely across said tidal bar as provided for by said contract.

"The opening of the channel at Pass à l'Outre and the inspection thereof as above, were accomplished on the 10th day of September, 1858.

"Hence the contract price, viz: $125,000, stipulated to be paid for the *opening* of the channel, is now fairly due and payable to the contractors or their legal representatives, on account of the work done by them at and near the mouth of Pass à l'Outre.

"All needful and proper details and explanations not only in reference *opening of the channel* having been accomplished, inspected and ready for acceptance on the 10th day of September, 1858, the second branch or object of the same contract, viz: the *keeping open* of said channel, will take effect and be in force from and after the same date, viz: the 10th day of September, 1858.

"Hence also, the first branch or object of said contract, viz: the to Pass à l'Outre, but to the Southwest Pass, which I have also inspected

ı my late tour for these purposes will be exhibited as early as praccable in a subsequent report.

"Respectfully, sir, &c.,

"S. H. LONG,

"*Lieutenant Colonel Topographical Engineers.*

"Colonel J. J. ABERT,

"*Chief Topographical Engineers, Washington, D. C.*"

The torpedos first used were of boiler iron, heavy, unwieldy and in ;her respects difficult to manage. They were sunk by the side of a ıide pile driven vertically into the mud lump that was to be blasted. perforation was made in the same lump at the side of the driven ile by means of another similar pile for the reception of the torpedo ıto the substance of the lump. Their ignition was effected by means ' an iron tube screwed to the torpedo and rising perpendicularly om the torpedo a little above the surface of the water. A hammer ›nsisting of a bar of iron ten inches long and three quarters of an ch square pierced with a key hole for the reception of a spring key ith a bow or eyelet at the folded end, to which a long slender line as attached, was so adjusted as to pass freely down and within the ıbe on the withdrawal of the key by means of the line. When 'opped the hammer fell freely through the tube and its lower exemity hit upon one or more percussion caps in the upper end of the rpedo and the explosion instantly followed.

Of this description of torpedos five only were blasted when the torıdo of tin and Mr, Baker their expert operator were introduced. he form and size of these torpedos have already been sufficiently deribed. They were sunk and anchored at the bottom wherever blasts ere required, by means of suitable weights in the form of small bags led with sand, attached. They were ignited by means of long flexle electric-conductors attached to them prior to being submerged. he electricity by which they were exploded was generated by means a small galvanic battery with twenty seven plates, six and a half ches square,

Operations with iron torpedos are obviously far more dangerous ıd expensive, and far less expeditious than those with the tin torıdos. The delays and interruptions attending the former, especially stresses of weather, are far more frequent and protracted than those tending the latter, in almost any state of fair weather. It is believed at ten or twelve tin torpedos may be deposited and exploded in the ne required to set and explode a single iron torpedo, while the 'ect produced by each of the former is quite as useful and efficient that produced by the latter.

With regard to the pile work done at this pass, the line of piles s been formed and extended downward from its head about 300 rds below the light-house, through a distance of 1,300 feet. The ıterials on hand, applicable to its further extension, consist of fifty uare piles, sixty feet long and about one foot square, 30,000 feet, board ›asure, of plank piles, battens, ribands, &c., and a considerable antity of iron in bars, bolts and spikes. The water craft pile drivers

that now only fourteen feet of water can be found thereon. Those engaged in navigation have entirely abandoned the use of this old outlet, and vessels are now passed entirely through the new, or Kimball's channel.

The pile dam remains in the same condition as when inspected by you in May. * * * *

WM. JOHNSON, *Supervisor.*

Lieutenant Colonel LONG,
United States Army.

The soundings mentioned in the foregoing extract are said to have been made at a stage at least six inches below mean tide or ordinary low water.

My personal examinations, soundings, &c., made on the 11th of September instant, were performed when the water was at a stage a little above ordinary low water, and the soundings called and recorded in the subjoined synopsis were cried out with the additional of *large* or *half* to the depth recorded.

The soundings were made in a double series on the larboard and starboard sides of the steamer Downs, from the can-buoy to the deep water of the Gulf along the southeasterly side of the new channel and back again to the can-buoy, on the northwesterly side of the channel.

Synopsis of soundings at the sides of the new channel in Southwest Pass.

Outward trip—
19, 19, 18, 18, 18, 18, 19, 19, 19, 19, 19, 19, 19, 19, 18, 18, 19, 18, 18, 18, 18, 19, 18, 19, 19, 19, 18, 19, 18, 19, 19, 19.

Outward trip—
19, 19, 18, 19, 18, 18, 18, 19, 19, 19, 19, 18, 19, 18, 18, 18, 18, 18, 18, 18, 18, 18, 19, 19, 18, 18, 18, 18, 18, 18, 18.

Outward trip—
18, 18, 19, 18, 18, 18, 18, 18, 18, 18, 19, 19, 21, 18, 18, 18, 18, 18, 18, 18, 18, 18, 19, 20, 22.

Return trip—
21, 23, 22, 21, 22, 21, 23, 20, 19, 18, 18, 19, 19, 18, 19, 22, 20, 22, 22, 21, 18, 18, 19, 19, 18, 18, 18, 18, 18, 18.

Return trip—
19, 18, 18, 18, 19, 19, 18, 19, 19, 18, 18, 19, 19, 18, 18, 18, 19, 18, 18, 19, 19, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18.

Return trip—
18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 19, 18, 18, 18, 19, 18, 18, 18, 18, 18, 18, 18, 18, 18.

Return trip—
18, 18, 18, 18, 19, 19, 18, 19, 19, 19, 18, 19, 19, 19, 19, 20, 20, 18, 19, 18, 18, 18, 19, 19, 19, 19, 19, 18, 19, 19, 19, 19, 19, 20.

From the soundings recorded in this synopsis and from those taken by Captain Johnson, in the month of July last as stated in his report before cited, it is quite evident that the channel across the tidal bar at the Southwest Pass, as opened and accepted on the 28th of May last, has continued open to the width and depth required by the

modified contract from the date last mentioned to the date of my late inspection of said Southwest Pass.

With respect to the pile wing dam constructed by Messrs. Craig & Righter, at this pass, its condition is still similar to what it was represented to be in my inspection report of the 3d of June last. The only change observed consists in the enlargement of its breaches and other indications of its instability and deterioration. This structure has no doubt contributed in some degree to the improvement of the pass, but it has never been regarded by me as essential either to the opening of the channel, or to the keeping of it open; and my repeated observations have contributed to strengthen and confirm that opinion.

I am now satisfied that the blasting of torpedos at the bottom and sides of the channel across the tidal bars, is the surest and most effectual means within my knowledge, not only of *opening*, but of *keeping open* the channels, both of the Southwest Pass and of Pass à l'Outre. And whatever may be the specific terms of the contracts made for these purposes, I am decidedly of the opinion, that the actual accomplishment of the objects in view by any means whatever should be regarded as the legitimate fulfilment of the contracts.

In conclusion, it is fair and proper to remark, that the mode of operation that has proved so eminently successful in opening the channels across the tidal bars, has been borrowed from that adopted by Benjamin Maillefort, esq., in his memorable operations at Hurl Gate, while engaged in blasting and removing submarine works at that once formidable pass. A device so ingenious and at the same time so magnificent is entitled not only to a respectful notice, but to a generous reward.

S. H. LONG,
Lieutenant Colonel Topographical Engineers.

Colonel J. J. ABERT.

APPENDIX—Doc. No. 7.

UNITED STATES TOPOGRAPHICAL OFFICE,
St. Louis, June 10, 1858.

SIR: I have been furnished with a copy of your order from the Topographical Bureau assigning you to the duties heretofore confided to Lieutenant Bryan, of the Corps of Topographical Engineers.

The duties mentioned relate to the construction of a road from Fort Riley to Bridger's Pass, in the Rocky mountains, and also from Fort Riley to Arkansas river, for both of which appropriations have been made by Congress, and in both cases considerable balances remain to be expended.

Agreeably to papers, &c., received from Lieutenant Bryan, it appears that a balance of $8,616 23¼ remains unexpended, and is

now applicable to the construction of the road first mentioned, and various other items of public property at Fort Leavenworth, Kansas Territory, such as horses, mules, &c., the sale of which has been authorized by the War Department, are also available for the same service. In reference to the road last mentioned, it also appears that a balance of $413 09 remains unexpended, and is applicable only to the construction of this road.

Sundry articles of public property appertaining to the office occupied in this city by Lieutenant Bryan are moreover applicable to the service under consideration. The funds and all other public property mentioned in this and the preceding paragraphs will be made subject to your disposal on your receipts for the same, executed in due form.

With regard to the items of public property at Fort Leavenworth, as above-mentioned, no inventory thereof has been received at this office. You will have need of such a document, and are desired to apply for it by letter to the bureau.

Your experience in works of the kind herein contemplated will be your safest guide to their accomplishment; accordingly, no specific instructions will be given at this time in reference to the prosecution of the duties before you, except those contained in the contract, duplicates of which are herewith furnished for the use of yourself and the contractor.

It should moreover be observed, that the drawings referred to in the contract have not been forwarded to this office. It will accordingly be advisable that you apply to the Topographical Bureau for said drawings, and have them sent to your address.

With respect to the public property at Fort Leavenworth it should also be observed, that in the event of a reception of an inventory, which is expected from Lieutenant Bryan, it will be at once transferred for your use and information; and on the receipt thereof, you will proceed to Fort Leavenworth and inspect said property, and receipt therefor in due form, and forward receipts as usual for the use of Lieutenant Bryan. Having received the property, you will dispose of the same in the manner explained in a letter of Lieutenant Bryan to Colonel Abert, dated on the 29th of March, 1858, and referred to the honorable Secretary of War by Colonel Abert, in a letter dated on the 3d of April, 1858, and approved by the honorable Secretary on the 28th of April, 1858, copies of which are herewith furnished for your information and guidance.

Should the proceeds from the sale of said property be sufficient, with the cash funds now applicable to the construction of the road, to meet the contract price for the construction, viz: $12,500, you will proceed at once with the construction of the road, and when it shall have been completed, you will return to this station and report your doings in the premises.

S. H. LONG,
Lieutenant Colonel, Topographical Engineers.

Captain E. G. BECKWITH.

APPENDIX—Doc. No. 8.

UNITED STATES TOPOGRAPHICAL OFFICE,
St. Louis, July 27, 1858.

SIR: Having bestowed much attention to the statement of differences forwarded from your office under date of the 20th day of March last, I am prepared to submit the results of my investigations in relation to this subject.

The results obtained are exhibited in a series of tabulations under distinct heads or classes, numbered 1, 2, and 3, which contain the several items suspended or disallowed in my accounts, according to decisions made through your office.

The items contained in the classes will be considered and explained in the following order:

Class 1.—This class relates to and comprises sundry vouchers, which, although they have been disallowed in full or in part by the accounting officers, are nevertheless believed to be correct and just; and the sums charged therein having been well and truly paid by me, ought in fairness to be set to my credit. This class is accompanied with explanatory vouchers, which have been carefully prepared, and are now submitted as substitutes for the original vouchers of the same or similar import.

In regard to this class, I take leave respectfully to appeal from the decision of the accounting officers to that of the honorable Secretary of War, which I hope and trust will prove more favorable than the former.

Copies of the substituted vouchers appertaining to this class have also been prepared, and are herewith presented for your inspection and use.

With regard to remunerations withheld from the United States engineers of both corps, by the Quartermaster's Department, such as commutations, and for quarters and fuel, allowances for travel and transportation, allowances for offices and fuel, and for various other contingent expenses, it is proper to observe that I have often been compelled to avail myself of the privilege of drawing funds from the appropriation, (or from unexpended balances thereof,) the expenditure of which had been committed to my charge as a disbursing officer. In this way and for the purpose of securing to myself and others the rights and immunities guarantied by law or regulations, I have had frequent occasions to draw funds from any appropriation confided to my disbursement, of which a sufficient balance remained in my possession, not regarding how such a course might comport with the adjustment of my accounts with the accounting officers at Washington.

For example, at the end of the year 1853, as in the class following, (see class 2d,) I drew from the appropriation for the survey of the Falls of the Ohio, on account of my per diem allowance, as a member

of the Board of Lake harbors and rivers, $490; the allowance as above covering a period of five months, viz: from the 1st of May to the 31st of December, 1853; my right to this allowance having been established and approved by the War Department, and no other provision having been made for the liquidation of the claim, while at the same time I was in charge of an unexpended balance of this appropriation.

Another similar example occurred at the end of the third quarter of 1854, as exhibited in the same class. I then drew $546 on the same account from the appropriation for the survey of the delta of the Mississippi, knowing no other source whence I could derive my per diem allowance for the first, second, and third quarters of that year.

Class 2.—This class embraces a series of vouchers for per diem allowance, all of which have been suspended by reason of the uncertainty of the duration for which the several charges therein have been made.

With respect to the resources or appropriations from which the means of liquidating these and various other charges have been derived, I take leave to observe that in all cases in which the rights and immunities of myself and others have been officially involved, I have sought relief and indemnity in the application of any means under my control, especially when I could not avail myself of any other means of relief.

Although I regard my claims under this head as equitable and just, yet I shall cheerfully abide any decision that will put me on a similar footing with that of each of my colleagues on the Board of Lake harbors and western rivers, in sharing the allowances that may be awarded.

Class 3.—In regard to the items contained in this class, I have no reason to doubt that the errors stated therein, have been correctly stated. Accordingly in my next quarterly accounts I purpose to have them duly entered to the credit of the United States.

General remarks.

In reference to the arrangement of sundry incidental charges introduced under the general head of "improvement of western rivers at large," I perceive that such a heading does not find favor with some of the accounting officers of the Treasury Department. My views in regard to this subject have already been given in a report to the Topographical Bureau, dated on the 27th day of January, 1858, and are contained in an extract therefrom, which is as follows:

"Hence it was deemed advisable and proper to arrange the proceeds from the sales under the general head of 'Improvement of western rivers at large,' to be applied indiscriminately to all objects of expenditure incident to the prosecution of improvements on all western rivers for which appropriations had been made.

As exemplified in my accounts under this head, for the first and second quarters of 1857, (herewith returned,) as also in my accounts

for the third and fourth quarters of the same year, (already forwarded to the bureau,) it will be perceived that the objects of expenditure are all incidental and comprise allowances for transportation, for clerk hire, for commutation of quarters and fuel, for office rent, for stationery, and for various other incidental expenses, all necessary to the performance of the various duties committed to my charge, for none of which is there any other fund from which they could be cancelled and paid.

In further explanation of my views of the case, I take leave to observe that a large portion of the incidental expenses charged under this head, has been incurred in visiting and inspecting numerous works and operations within the district of my superintendence for which I did not serve as disbursing officer, and of course had no control of the funds appropriated for their execution. The expenses incident to the inspection of the works and to the performance of the various office duties connected therewith could not be defrayed by funds derived from any appropriation except those only for which I may have served in the capacity of a disbursing officer.

The charges for commutation of quarters and fuel, for clerk hire, for rent, fuel, stationery, &c., for office are in the same predicament with respect to the resources available for their liquidation. Hence, the propriety and even necessity of some general fund out of which such expenditures may be defrayed; and the heading in question seems quite as appropriate as any other that could be adopted for such a fund.

Moreover the impropriety of defraying all such expenses out of a few of the appropriations (viz: three only out of at least twelve equally and similarly implicated) that remain unexhausted, in a ratio corresponding to their original amounts, must be apparent at a mere glance, while the practicability of arranging them in a convenient manner under any existing appropriations, the unexpended balances of which do not bear the same relations to their originals, is to say the least, very questionable.

The three appropriations alluded to, are those for the Mississippi, Missouri and Arkansas rivers, the original appropriations, and the unexpended balances of which are as follows, viz:

For the Mississippi, original appropriation, $90,000; unexpended balance, $1,092 19; for the Missouri, original appropriation, $40,000, unexpended balance, $1,574 94; for the Arkansas, original appropriation, $40,000, unexpended balance, $1,894 12.

Hence, by *pro rata* disbursements it is obvious that the balance for the Mississippi, is much the least and must be soon entirely exhausted; that the balance for the Missouri must soon after share the same fate; till at last, that for the Arkansas will become the only source from which the expenditures above considered can be defrayed.

Accordingly, the mode of disposing of unexpended balances, by *pro rata* absorption is manifestly inconsistent, improper, and impracticable.

S. H. LONG,
Lt. Col. Topographical Engineers.

Hon. R. J. ATKINSON.

APPENDIX—Doc. No. 9.

BUREAU TOPOGRAPHICAL ENGINEERS,
Washington, August 6, 1858.

SIR: You were informed in my letter of the 14th instant that yours of the 10th had been submitted to the War Department. The following is a copy of the direction endorsed thereon.

"WAR DEPARTMENT, *August*, 1858.

"It is not at present contemplated by the department to revive the superintendency of western rivers abolished in 'Special Order 160,' December 11, 1856. Should further appropriations by Congress be made, the subject will be considered by the department.

"The balance of western river appropriations in Colonel Long's hands will be turned over to Captain Abert as directed by the Colonel of Topographical Engineers, as a mode by which these matters shall be finally adjusted and settled.

"J. B. FLOYD,
"*Secretary of War.*"

J. J. ABERT.

Lieut. Col. S. H. LONG.

APPENDIX—Doc. No. 10.

CAMP OF THE WAGON ROAD FROM FORT RILEY TO BRIDGER'S PASS OF THE ROCKY MOUNTAINS ON PARSON'S CREEK OF THE REPUBLICAN FORK OF THE KANSAS RIVER, *Kansas Territory, September* 27, 1858.

SIR: I have the honor to report that the execution of the work under the contract for that portion of the "wagon road from Fort Riley to Bridger's Pass of the Rocky mountains" located by Lieutenant F. T. Bryan, Topographical Engineers, lying between Forts Riley and Kearney, upon which Lieutenant Bryan contracted on the 20th day of March last for the construction of certain bridges, grading &c., with Mr. Alfred Hebard, and which contract, before its final ratification by the Secretary of War, was slightly modified by myself and the said Alfred Hebard, was, upon the approval of the modified contract in August last by the Secretary of War, immediately commenced by the contractor. A small part of the grading has been done and several of the framed as well as the log bridges erected; those between this point and Fort Riley, so that the road is now in good travelling condition for fifty miles above Fort Riley as it will be to Fort Kearney on the completion of the contract work to that post. The bridge over Parson's creek upon which the contractor is now at

work, will probably be completed by the 5th or 6th of next month, October, and should the season prove favorable for work on the plains in November, there is now no reason to doubt that the entire work contracted for upon this section of the road will be completed within the contract time, the first of December next. The payment for the work upon its completion under this contract will nearly, if not quite, exhaust the balance now unexpended of the original appropriation for this road.

Should further appropriations be asked for military roads between Fort Riley and Utah at or in the vicinity of Bridger's Pass, I beg respectfully to suggest for the consideration of the bureau, a route crossing the Republican Fork of the Kansas river at or in the vicinity of Fort Riley, and thence following, as far as practicable, between the main forks of the Kansas river by such route west as shall be shortest and most feasible for travel and thence to Bridger's or any more feasible pass in the vicinity, in the Rocky mountains.

E. G. BECKWITH,
Captain 3d Artillery.

Lieut. Colonel S. H. LONG.

P. S. The maps and drawings submitted to the bureau with the contract referred to above by Lieutenant Bryan, sufficiently illustrate the work upon this road.

E. G. B.

APPENDIX C.

Lieutenant Colonel J. D. Graham's report (No. 230) on the Lake harbor works under his direction, for the year 1858.

OFFICE GENERAL SUPERINTENDENCE OF LAKE HARBOR WORKS,
Chicago, November 15, 1858.

SIR: This, my annnal report for the year 1858, on the Lake harbor works under my direction, relates to the improvement and repair of the harbors on the north and northwestern lakes, as follows, viz:

I. LAKE MICHIGAN.

1. Chicago harbor, Illinois.
2. Waukegan breakwater, Illinois.
3. Kenosha harbor, Wisconsin.
4. Racine harbor, Wisconsin.
5. Milwaukie harbor, Wisconsin.
6. Sheboygan harbor, Wisconsin.
7. Manitowoc harbor, Wisconsin.
8. Michigan City breakwater, Indiana.
9. New Buffalo harbor, Michigan.
10. St. Joseph harbor, Michigan.
11. Black Lake harbor, Michigan.
12. Grand Haven harbor, at the mouth of Grand river, Michigan.
13. Mouth of South Black river, Michigan.
14. Mouth of Kalamazoo river, Michigan.

II. LAKE SAINT CLAIR.

15. Mouth of Clinton river, Michigan.

III. LAKE ERIE.

16. Monroe harbor, mouth of the river Raisin, Michigan.
17. Sandusky harbor, Ohio.
18. Huron harbor, Ohio.
19. Vermillion harbor, Ohio.
20. Black River harbor, Ohio.
21. Cleveland harbor, Ohio.
22. Grand River (Fairport) harbor, Ohlo.
23. Ashtabula harbor, Ohio.
24. Conneaut harbor, Ohio.
25. Erie harbor, Pennsylvania.
26. Dunkirk harbor, New York.
27. Buffalo harbor, New York.

IV. LAKE ONTARIO.

28. Oak Orchard harbor, New York.
29. Genesee harbor, (mouth of Genesee river,) New York.
30. Sodus Bay harbor, Wayne county, New York.
31. Sodus Bay harbor, Cayuga county, New York.
32. Oswego harbor, New York.
33. Ogdensburg harbor, New York.

V. LAKE CHAMPLAIN.

34. Burlington breakwater, Vermont.

The works and harbors in the above list, thirty-four (34) in number, were reported on in my annual report for 1857, printed in Senate Executive Document, No. 42 of the 35th Congress, 1st session, and also in H. R. Document, No. 23* of the same session. They will be taken up here in the same order.

I. LAKE MICHIGAN HARBOR WORKS.

1. CHICAGO HARBOR, ILLINOIS.

Repair of the harbor piers.

The dilapidated condition of the Chicago harbor piers has been fully set forth in my three previous annual reports on this harbor, to be found printed at pp. 22 to 127 and from pp. 302 to 336 of Senate Executive Document, No. 16 of the 34th Congress, 3d session, and at pp. 4 to 60 of Senate Executive Document, No. 42 of the 35th Congress, 1st session.

I regret to be obliged to report that the condition of these piers is now much worse than it has ever before been. The interests of commerce have suffered much from the want of means to repair them and to keep the bar subdued by dredging.

The timber work above water of the whole of the southern pier, and of that portion of the northern pier included between its eastern extremity and the most western angle, (marked A in red on the accompanying three copies of map G, No. 52,) is all now in so rotten a condition that it must be immediately torn away and substituted by sound materials.

I have here to repeat my recommendation that the whole of this pier work above a plane one (1) foot below the low water level be replaced by stone masonry. It is only in this way that this valuable commercial harbor can be permanently put in a condition essential to the commerce of the lakes. The great value and extent of this commerce were fully set forth in my annual report for 1855. It was my

* The report is more correctly printed in the Senate Document, No. 42, than in the H. R. Document, No. 23.

wish to exhibit it again, together with that of the other lake harbors under my direction for the present year, in this report, and for that object I have been collecting extensive statistics.

I have found it impossible, however, to digest and arrange them in a proper form in time for this report. I propose to make this the subject of a separate report at a future time, and as soon as practicable.

They will be found to contain very important results bearing upon the importance of keeping our lake harbors in good condition, considered, as heretofore, both in a military and commercial point of view, and they will be brought down to include the end of the present year, after the system which was adopted in my reports for 1855 and 1856, printed in Senate Executive Document, No. 16 of the 34th Congress, 3d session, p. 480.

The breach in the north pier, made on the 7th of November, 1857, by the collision of a vessel against it in a gale of wind, mentioned in a note at the bottom of page 10 (Senate Doc. No. 42 of last session) of my annual report for 1857, was repaired in the best manner that the limited amount of funds on hand would admit. This repair exhausted the balance of the last appropriation for this harbor.

On the 18th of August of the present year (1858) the schooner "Albany" was carried in a gale of wind violently against the north harbor pier at the point marked B in red on the accompanying three copies of map G, No. 52, and broke several of the timbers on the river face of the pier. The damage thus caused was, on the 4th of September following, much increased by a collision, near the same point, by the propeller "Free State," which broke every timber of the pier wall, from its top down to four (4) feet below the water surface, on the river face, and, extending through the pier, damaged several wall timbers on the landward face.

On the 1st of October ultimo the propeller "Sun," in entering the harbor, struck the north pier very near the point of collision of the "Albany" above mentioned, and not only carried away the repairs which followed the first mentioned injury, but also broke every timber from the top of the pier to two (2) feet below the water surface.

We now had to contend against a clear breach through the pier, causing the waves, in south and southeasterly winds, to wash and abrade the sandy shore of the river at the points in question.

During the present month of November the force of the lake sea, in strong gales of wind, has dislodged some of the timbers of the pier head at the east extremity of the north pier, and also at several other places along the south face of that pier. These timbers are either in such exposed positions and partly decayed, or in less exposed positions and so entirely decayed that they oppose very little resistance to these forces.

The damages above reported placed the harbor of Chicago in a very critical condition. Without a dollar of public money applicable to the requisite repairs, and with all the responsibilities resting upon me to save the harbor, by every means that I could legitimately command, from the destruction which awaited it unless the threatened

breach from the river across the sandy promontory into the lake could be checked, I determined to set the United States dredge-boat to work on the bar to dig sand and sell it to raise funds for this object. Accordingly this was done, and with the proceeds, together with a small amount charged to light-house repairs, in order to prevent the communication to the beacon light from being cut off, the repairs have been attended to from time to time as these disasters occurred, and are, at this date, (November 15, 1858,) being continued. Of course these repairs can only be of a temporary character, owing to the very limited amount of money that can be commanded for them.

I must again recommend that the means to make the permanent repairs in stone be granted at an early a day as possible, and that they be in accordance with the plan set forth in the accompanying estimate, marked A 1.

Extension of the south harbor pier.

I also repeat the recommendation, contained in my annual reports for 1856 and 1857, that the south pier be extended four hundred and eighty (480) feet lakeward of its present terminus, and for the reasons given in full in those reports.—(See Senate Ex. Doc. No. 16, 34th Congress, 3d session, p. 311; and Senate Ex. Doc. No. 42, 35th Congress, 1st session, p. 11.) The necessary means for this extension are also in the estimate A 1.

A small basin for protection of United States property.

The United States have parted with all the ground which was held for public purposes under the Fort Dearborn reservation. They possess now no conveniences whatever for constructing the cribs for the south pier extension, or for the mooring of the United States steam dredge and her scows when at work for the improvement of this harbor, or for the protection of the floating machinery, such as pile-drivers, scows, harbor boats &c., or for the security of the timber, delivered under contracts, for purposes of repair or construction. The cribs, to form a line of pier-work composed of wood, iron bolts, and stone ballast, must be built up to a certain height whilst afloat, and must, while this work in going on, be protected from the waves of the lake or river during windy weather. The steam dredge-boat, scows, floating pile-drivers, harbor-boats, &c., require equal protection when not at work.

For these several purposes I recommend that a basin be constructed at the angle formed by the junction of the Illinois Central Railroad Company's pier with the United States South harbor pier. The proposed dimensions for this basin are three hundred and twenty (320) feet long by one hundred (100) feet wide, and ten (10) feet deep.

It is drawn in red on the three accompanying maps, marked G No. 52, and the cost is included in estimate A 1.

A steam dredge for Chicago harbor.

It is considered very important that a steam dredging machine, with scows, should be provided especially for this harbor.

I have become more and more convinced, as I have become better acquainted with the character of the Chicago bar and the hydraulic law governing its formation, that it can best be kept subdued by habitual annual dredging, and at a much less expense than by any other means. We have already demonstrated, by the practical operations in 1854 and 1856, that a direct channel over this bar, by the north pier-head, can be kept constantly open to a width of three hundred and fifty (350) to four hundred (400) feet by thirteen (13) feet deep, for an annual expense, in using a dredging machine, of two thousand five hundred to three thousand dollars; that is to say, $2,500 to $3,000. On this point we would ask a reference to maps G, Nos. 11, 12, 38, 43, 44, and 52, to be found in the Topographical Bureau and in the archives both of the Senate and House of Representatives.—(See also Senate Ex. Doc. No. 16, 34th Congress, 3d session, pp. 22 to 26, and pp. 303 to 307.) *

We consider the idea of preventing the formation of the Chicago bar—either by an extension of the north harbor pier or by constructing a counter pier out in the lake, so as to produce an increased current in the channel-way to be left between it and the end of the north pier, for the purpose of wafting the silt to leeward, past the mouth of the river—as entirely inexpedient and inapplicable to the improvement in question. While either of these plans would be far more costly than dredging, neither of them would, in our opinion, ensure the same success.

The cost of the proposed steam dredging machine and scows is included in estimate A 1.

The dredging of Chicago bar.

A reference to the six maps of Chicago harbor and bar last mentioned, and also to maps G, Nos. 22 and 23, of the same harbor and bar, each showing their aspect at different periods between April, 1854, and April, 1857, will be sufficient to convince any one that however often this bar may be removed by dredging, it will re-form itself by the deposits caused by the meeting of the littoral or shore current of the lake with the obstruction of the east end of the north pier; and, moreover, that it will always assume identically the same direction, shape, and dimensions, as to width, which it had before being cut away by dredging.

Here, then, we have the uniform effect of a fixed hydraulic law exhibited, which is of great value in discussing the question as to

* The net cost to the United States of the dredging of this bar in 1856 was erroneously printed in line 12, at page 307 of the above mentioned document, as $4 83 per cubic yard. It should have been printed 4.83 cents; that is to say, four cents and eighty-three hundredths of a cent per cubic yard.

the best mode of keeping an open channel through it, and also sure data for computing the expense of producing such a channel by dredging.

In the present instance, in order to produce the desired channel to a depth of thirteen (13) feet below the ordinary or mean level of the lake, it will require the removal of twenty-two thousand (22,000 cubic) yards of sand.

The expense of this item is introduced in estimate A 1.

Recapitulation of items in estimate A 1, hereto attached.

1. For repairing piers in stone masonry	$152,405 04
2. For extending the south pier 480 feet	28,924 95
3. For a basin for the preservation and protection of public property	18,080 47
4. For a steam dredge and scows	17,500 00
5. For dredging Chicago bar	2,200 00
6. For a set of meteorological instruments	232 50
Amount required for Chicago harbor	214,342 96

I recommend that the above sum be granted in two equal annual appropriations of $109,671 48 each.

A reference to the various positions occupied at various periods by the lake shore line, north of this harbor, shown on map G, No. 52, shows that, while the north pier projected into the lake far to the east of the shore line, the formation of new land by accretion caused by the deposits of the silt brought down by the littoral current was nearly in the direct ratio of the elapsed time; but that in proportion as the general direction of this new shore line approaches to a coincidence with the direction or thread of this littoral current, the increase is much less rapid, nearly in the inverse ratio of the elapsed time.

I mention these facts in refutation of the idea which has been advanced that the piers can produce no permanent benefit in keeping the harbor open, but that the shore-line will progress further and further out, until it transcends the eastern limit of the north pier.

By the aid of habitual dredging in the manner already mentioned, and at a comparatively small annual cost, there is no reason we think to doubt that the piers will perform effectually the office for which they were intended, and for a very long period to come, without a further extension into the lake.

Openings in the harbor piers to accommodate ship basins.—The second bond of the Illinois Central Railroad Company, dated May 21, 1858, and the conditions stipulated under which the said company was permitted to make a second opening in the United States south harbor pier to communicate with its second ship basin, have, since my last annual report, been duly executed, and is hereto attached, marked A, 2.

They are recorded at page 205, in Book No. 40 of Mortgages, in the office of the clerk and ex-officio recorder of Cook county, Illinois, at Chicago.

The reference map thereto appertaining is recorded in the same office in Book No. 143, at page 0, or one page preceding page 1.

The first bond of the same company, dated April 20, 1855, and the conditions under which it was permitted to make an opening in the said pier to communicate with its first ship basin are recorded in the same office at Chicago, at page 469, in Book 130, of Deeds. The illustrative map attached to the same is recorded at page 27, in Book 133, of Maps, in said office. These documents are printed at pages 58 to 62, in Senate (Ex.) Documents, No. 16, of the 34th Congress, 3d session.

The agreement and consent of the parties in interest to the line of excavation for the improvement of the navigation of Chicago river, under the act of Congress approved July 21, 1852, namely: John Baptiste Beaubien, the Illinois Central Railroad Company, the corporate authorities of the city of Chicago, and the United States, dated September 26, 1855, was duly recorded at page 463, in Book 130 of Deeds, and the reference map thereto attached was recorded at page 26½, (twenty-six and a half,) in Book 133, of Maps, in the same office. This paper is printed at pages 79 to 81 of the aforesaid senate document.

The bond of the Chicago Dock and Canal Company, dated November 11, 1858, and the conditions stipulated under which the said company has received permission to make an opening in the United States north pier of Chicago harbor, to communicate with the said company's intended ship basin and canals, authorized by the act of incorporation granted by the State of Illinois, of February 12, 1857,* have been duly executed by the said company, and is hereto attached, marked A, 3. So soon as the maps of reference can be completed the document will be forwarded for the action of the War Department, after which it will be recorded at Chicago.

Monthly averages of the elevation of the surface of Lake Michigan.

These were given in my annual report for 1857, for the period embraced between September 1, 1854, and September 30, 1857, embracing a period of three years.*

The observations upon the tide-gauge at the east end of the north pier, (see map,) have been continued to the present time.

From February 9 to March 15, inclusive, 1858, the gauge at this point was frozen fast in its box and did not operate. The registers for that period were, therefore, made by a similar tide gauge which, in November, 1857, I established within the well of the city waterworks, situated (see map G, No. 52) a few feet east of Pine street,

* This act of incorporation is printed in Senate (Ex.) Doc., No 42, of the 35th Congress, 1st session, at pp. 49 to 51.

†See page 7 of Senate (Ex.) Document, No. 42, 35th Congress, 1st session.

between Chicago avenue and Pearson street. Here the gauge is protected from freezing, even in the coldest weather. It was so adjusted, when set in position, that the zero (0) of its graduated rod is in the same level, or horizontal plane, with the zeros of the gauge at the east end of the north harbor-pier, and at Rush street bridge.

The following are the monthly averages from October 1, 1857, to October 31, 1858, a period of thirteen (13) months, viz:

Monthly averages of the elevation of Chicago river at Rush street bridge Chicago.

Year.	Month.	Monthly mean height of the lake surface, per tide-gauge, in feet and decimals.
1857.	October, thirty-one days observed	3.913
	November, thirty days observed	3.136
	December, thirty-one days observed	3.110
1858.	January, thirty-one days observed	3.042
	February, twenty-eight days observed	2.783
	March, thirty-one days observed	2.904
	April, thirty days observed	3.221
	May, thirty-one days observed	3.704
	June, thirty days observed	4.125
	July, twenty-nine days observed	4.512
	August, thirty-one days observed	4.470
	September, thirty days observed	4.076
	October, thirty-one days observed	3.928

These were given in my annual report for 1857, (see page 8 of printed Senate Ex. Doc., No. 42, of the 35th Congress, 1st session,) from April 1, 1856, to September 30, 1857, embracing a period of eighteen months, from observations on the tide gauge at first situated at the old ferry, and afterwards at the ice-breaker of the Rush street bridge.—(See map G, No. 52.)

The following monthly averages are obtained from observations upon the same tide-gauge, made between the first of October, 1857, and the 31st of October, 1858, a period of thirteen (13) months. The zeros of the two tide gauges are in the same horizontal plane or level.

Monthly averages of the river gauge.

Year.	Month.	Monthly mean height of surface of Chicago river at Rush street bridge, in feet and decimals.
1857.	October, thirty-one days observed	4.106
	November, thirty days observed	3.303
	December, thirty-one days observed	3.334
1858.	January, thirty-one days observed	3.230
	February, only eight days observed; ice prevented more; river frozen	3.056
	March, only eighteen days observed; river frozen over; the rest of the time this month	3.197
	April, thirty days observed	3.383
	May, thirty-one days observed	3.867
	June, thirty days observed	4.377
	July, twenty-nine days observed	4.643
	August, thirty-one days observed	4.720
	September, thirty days observed	4.418
	October, thirty-one days observed	4.128

From the foregoing results, it appears that the surface of Lake Michigan is at this time full two feet higher than it was in 1854.

This result has an important bearing on the question of height that should be given to all piers constructed on this lake.

They should not be less than five feet high above the extreme high-water stage of the lake along the margins of the rivers, and seven feet where they are bounded on both sides by the lake.

A.—LUNAR TIDE ON LAKE MICHIGAN.

The subject of a lunar tidal wave on our great fresh-water inland seas has attracted the attention of philosophers, so far as I am informed, only to a very limited degree.

From the comparatively small area of the waters to be acted upon by the lunar attraction, the disturbance in the elevation of their surface cannot, in any event, be but small. It is, indeed, so small that its measure is liable to be almost constantly exceeded by the effect of the winds. To obtain a satisfactory measurement of its co-ordinate requires careful observations at times when a calm lake-surface conspires with the period when the position of the moon in her orbit is such as to give her a maximum influence upon the tide. Patient and long-continued observations are indispensably necessary to obtain data sufficient for the complete solution of this problem.

During the past season I have instituted a series of observations touching this interesting question. Hourly, and sometimes half-hourly,

observations have been made of the height of the lake-surface when the moon was near the full; and, so far as the investigation has progressed, it brings us to the conclusion that there is a perceptible lunar tidal-wave on Lake Michigan, whose co-ordinate, measured from the mean level of the lake-surface, is as much as fifteen-hundredths to two-tenths of a foot; that is to say, 0.15 to 0.2 of a foot.

I have not had time, apart from the regular official duties devolving on me here, to collate all the observations that have been made so as to attach them to this report. This will, however, be done, and they will be submitted at a future time. In the meanwhile the observations will be continued whenever circumstances shall be favorable. I do not doubt that they will prove the existence of a lunar tidal-wave in our great lakes to the extent above mentioned.

Latitude and longitude of Chicago.

In my annual report of last year the longitude of Chicago was given west of Greenwich, as determined by electric signals, based upon my determination of the longitude of the centre of the citadel of Quebec, in the year 1842.—(See pp. 12 to 22, and 56 to 60 of Senate Ex. Doc. No. 42 of the 35th Congress, 1st session.)

On the nights of the 15th and 23d of August, and the 18th of September last, I observed with the sextant for the latitude of this place.

The stars observed on were arranged in pairs, and were selected so that one should pass the meridian to the north and the other to the south of the zenith, and at nearly equal meridian altitudes. This was done for the purpose of eliminating any small and imperceptible errors that might appertain to the instrument, either in the graduation of the circular arc or limb, in the position of the mirrors, or in the collimation of the telescope; and likewise for the elimination of any error of personal equation appertaining to the observer.

The stars observed on for determining the *time* were also selected in pairs of nearly the same declination, both north in this latitude, and of such right ascension that one could be observed when near the east and the other when near the west prime vertical, with but little elapsed time between their being at nearly equal altitudes when in these respective positions. If they could not be observed on the prime vertical, care was taken to observe them both on the same side of that plane, either both when north or both when south of it.

This was done for the purpose of the same eliminations above described, and also for the elimination of any small errors in the determination of the latitude, which was to be used as a term in the formula for computing the time.

In some instances equal altitudes of the same star were observed, east and west or before and after passing the meridian, for computing the time. This method ensures a perfect elimination of all the errors above alluded to.

With these precautions a practical observer may, even with so light and portable an apparatus as a sextant of 7½ inches radius, with

an artificial horizon of quick-silver, and a good watch or chronometer, obtain a pretty close determination of the latitude of a place by a few hours' work in a single night.

Observations.

1858, August 15. Time stars α (Alpha) Andromedæ E., and α (Alpha) Coroneæ Borealis W. Also equal altitudes of α (Alpha) Cygni.

LATITUDE OF STATION.

By 25 circum-meridian altitudes of Altair (α Aquilæ) S. combined with 17 ditto of γ (Gamma) Cephei N.	41° 53′ 46″.8
Samenight.—Latitude by 12 circum-meridian altitudes of α (Alpha) Aquarii S. combined with 10 altitudes of Polaris (α Ursæ minoris) N.	41° 53′ 45′.6
1858, August 23.—Time stars the same as on the 15th. Latitude by 24 circum-meridian altitudes of Altair S. combined with 18 ditto of γ (Gamma) Cephei N.	41° 53′ 47″.3
1858, September 18.—Time stars, α (Alpha) Andromedæ E., and α (Alpha) Coronæ borealis W. Also equal altitudes of α (Alpha) Pegasi	
Latitude by 15 circum-meridian altitudes of Altair S. combined with 26 ditto of γ (Gamma) Cephei N.	41° 53′ 46″.
Same night.—By 28 circum-meridian altitudes of α (Alpha) Aquarii, and 22 ditto of β (Beta) Aquarii, both S., combined with 18 altitudes of Polaris (α Ursæ min.)	41° 53′ 45″.8
Result.—Latitude of station by giving each pair of stars an equal weight	41° 53′ 46″.3

The point of observation was sixty-two (62) feet due north of the front door steps of my quarters. It was in the middle of the sidewalk on the north side of Huron street, and eighty (80) feet east of the middle of Wolcott street. It is also four hundred and three (403) feet south of the parallel and two hundred and nine (209) feet west of the meridian of the observing station near the Roman Catholic church, which was occupied in May, 1857, for determining the difference of longitude between this place and Quebec; for a full account of which see Senate (Ex.) Doc. No. 42, of the 35th Congress, 1st session. The longitude of that station was then given, (see page 20) as west of Greenwich, 5h. 50m. 30s.99.

Its latitude from the above data is ..... 41° 53′ 50″.3 N.

That station is near a point of triangulation in our survey of Chicago harbor, made in April, 1857, and was connected, in position, therewith by survey. It is marked "Temporary observatory" on map C, No. 52.

By our triangulation connected with the above two data we obtain

the geographical positions of other remarkable objects in the city of Chicago.

They are all given in the following table, viz:

Positions in the city of Chicago.	North latitude.	Longitude west of Greenwich.	
		In time.	In arc.
	° ′ ″	h. m. s.	° ′ ″
1. Temporary observatory of May, 1857, near the Roman Catholic "Church of the Holy Name," on Wolcott street	41 53 50.3	5 50 30.99	87 37 44.8
2. Another ditto in ditto, of 1858	41 53 50.52	5 50 31.15	87 37 47.2
3. Observing station, north side of Huron street, eighty feet east of the middle of Wolcott street	41 53 46.3	5 50 31.2	87 37 47.5
4. Steeple (front door) of the Roman Catholic "Church of the Holy Name"	41 53 48	5 50 31.18	87 37 47.7
5. Steeple of the Protestant Episcopal church of St. James, on Cass street, corner of Huron street	41 53 45.2	5 50 30.87	87 37 43
6. Dome of the Chicago city hall or court-house.	41 53 6.2	5 50 32.08	87 38 1.2
7. Base of the new iron light-house (unfinished) at the end of the north harbor pier.	41 53 24.9	5 50 27.93	87 36 59
8. Steeple of the west market-house, at the intersection of the middle of Randolph street with the west side of Des Plaines street	41 53 8.4	5 50 35.19	87 38 47.8
9. The point formerly occupied by the flag staff of Fort Dearborn, now destroyed	41 53 22.9	5 50 30.37	87 37 35.6

I have been thus particular because in drawing up a skeleton map of reference showing the relative positions of the harbors under my direction, and the consecutive distances between them, I was at first much deceived by the position assigned to Chicago by the American Almanac, a work that is much relied on as authority in this country. The position of Chicago is there given as in latitude 42° 0′ north, and longitude west of Greenwich 87° 35′, which is eight and one-third miles ($8\frac{1}{3}$ miles) of error in the assigned position of this place.

Very often the distance between two consecutive harbors proposed to be improved on the same lake-coast line, causes one of the two to be rejected, and hence it becomes important to the general lake commerce that the positions of these harbors should be laid down on a skeleton map of reference with approximate accuracy at least.

I am generally detained one night at each principal harbor when I make my visits of inspection, and if the Topographical Bureau will supply me with a good pocket chronometer, set on sidereal time, I can very easily, in one night of clear weather, fix the position of each with sufficient accuracy for our purpose, and thus correct some errors of magnitude in the reputed distances between harbors which the lake-coast survey has not reached, and may not for several seasons to come.

There is no balance remaining of the last appropriation, which was granted in 1852, for Chicago harbor improvement.

CHICAGO HARBOR, ILLINOIS.

A 1.

Estimate of the cost of repairing the United States piers at Chicago harbor, Illinois—for the extension of the south pier 480 feet to the eastward—for a basin east of and adjoining the Illinois Central Railroad Company's pier—for building cribs—for mooring and protecting the United States harbor-boats, scows, floating pile-drivers, and timber—for a new steam dredge and scows—and for dredging the bar and the harbor between the piers.

I. FOR THE REPAIRS OF THE PIERS IN STONE MASONRY.

This includes that portion of the north pier contained between the first angle, at the point marked A, in red on the accompanying copy of map G, No. 52, sent in triplicate with this report, and the east extremity of the said pier, a length of ..... 2,032 feet.

Also the whole of the south pier from the ship basin of the Illinois Central Railroad Company to the east extremity of the said pier, a length (see map G, No. 52,) of ..... 908 feet.

Total length to be repaired in stone masonry ..... 2,940 feet.

It is proposed to tear away the old rotten timber work from the above portions of the piers, from a plane one foot below the level of extreme low water in Lake Michigan, and to rebuild with stone masonry from that plane to a height of seven feet above the same on that portion of the north pier included between the point A and the present lake shore, a distance of 1,452 feet. From thence to the east extremity of the north pier, a distance of 580 feet, it is proposed to rebuild with stone masonry to a height of nine feet above the same plane.

In regard to the south pier, it is proposed to rebuild with stone masonry from its west extremity to the point where it meets the Illinois Central Railroad Company's pier, a distance of 500 feet, to a height of seven feet; and from thence to its east extremity, a distance of 408 feet, to a height of nine (9) feet above the same plane.

The whole of that portion of the north pier proposed to be repaired is 24 feet wide, and the south pier has, throughout, a uniform width of 20 feet.

Hence we have four units of comparison for founding our estimate, each one being assumed at one hundred (100) feet long. They are to be applied respectively to the following portions of the two piers, viz:

1. 1,452 feet of the north pier, 24 feet wide, to be built to a height of 7 feet in masonry.
2. 580 feet of the north pier, 24 feet wide, to be built to a height of 9 feet in masonry.

3. 500 feet of the south pier, 20 feet wide, to be built to a height of 7 feet in masonry.

4. 408 feet of the south pier, 20 feet wide, to be built to a height of 9 feet in masonry.

The units for these four cases will be as follows, viz:

1. *Estimate of the cost of the unit,* 100 *feet long by* 24 *feet wide, and* 7 *feet high, for the north pier.*

or tearing away and removing decayed wood work and the ballast stone now within the pier to one foot below the level of extreme low water, and preparing the bed to receive the stone masonry, at $3 per lineal foot	$300 00
For 130 cubic yards of dressed stone masonry, to extend to a width of five (5) feet from the river face of the north pier, at $11 per cubic yard, laid in cement, with iron clamps and dowel pins	1,430 00
For 493 cubic yards of masonry, to consist of large quarry stones hammered to fair and safe bearings, laid in cement; for filling in between the face work of the north pier, at $5 per cubic yard	2,465 00
Estimated cost per 100 lineal feet of masonry, 24 feet wide and 7 feet high, (*a*)	4,195 00

2. *Estimate for the unit* 100 *feet long by* 24 *feet wide, and* 9 *feet high, for the north pier.*

For tearing away and removing the decayed wood work and the ballast stone now within the pier, as above, and preparing the bed to receive the stone masonry, at $3 per lineal foot	$300 00
For 333 cubic yards of dressed masonry, to extend to a width of 5 feet within the lakeward and the river faces of the north pier, at $11 per cubic yard, laid in cement, with iron clamps and dowel pins	3,663 00
For 467 cubic yards of masonry, to consist of large quarry stones, hammered as above, and laid in cement, for filling in between the face work of the north pier, at $5 per cubic yard	2,335 00
Estimated cost per 100 lineal feet of masonry, 24 feet wide and 9 feet high, (*b*)	6,298 00

3. *Estimate for the unit,* 100 *feet long by* 20 *feet wide, and* 7 *feet high, for the south pier.*

For tearing away and removing the decayed wood work and the ballast stone now within the pier, to one foot below the level of extreme low water, and preparing the bed to receive the stone masonry, at $2 75 per lineal foot	$275 00
For 130 cubic yards of dressed stone masonry, to extend as before, to a width of 5 feet within the river face of the south pier, at $11 per cubic yard, laid in cement, with iron clamps and dowel pins	1,430 00
For 389 cubic yards of masonry, of large quarry stones, hammered as above, and laid in cement back of the face wall, at $5 per cubic yard	1,945 00
Estimated cost per 100 lineal feet of masonry, 20 feet wide and 7 feet high, (*c*)	3,650 00

4. *Estimate for the unit of one hundred feet long, by twenty feet wide, and nine feet high, for the south pier.*

For tearing away and removing the decayed wood work and the ballast stone now within the pier, as above, and preparing the bed to receive the stone masonry, at $2 75 per lineal foot	$275 00
For 333 cubic yards of dressed masonry, to extend to a width of 5 feet within the lakeward and river faces of the south pier, at $11 per cubic yard, laid in cement, with iron clamps and dowel pins	3,663 00
For 333 cubic yards of masonry of large stones, hammered to fair bearings, and laid in cement between the face walls, at $5 per cubic yard	1,665 00
Estimated cost per 100 feet of masonry, &c., 20 feet wide and 9 feet high, for the south pier, (*d*)	5,603 00

Using the four units of comparison above given, we get—

For 1,452 feet of the north pier to be built up 7 feet high and 24 feet wide, at (*a*) $4,195 per 100 lineal feet	$60,911 40
For 580 feet of the north pier to be built up 9 feet high and 24 feet wide, at (*b*) $6,298 per 100 lineal feet	36,528 00
For 500 feet of the south pier to be built up 7 feet high and 20 feet wide, at $3,650 (*c*) per 100 lineal feet	18,250 00

For 408 feet of the south pier to be built 20 feet wide and 9 feet high with masonry, at $5,603 (*d*) per 100 feet of length	22,860 24
Sum	138,550 04
Add 10 per cent. for contingencies	13,855 00
(I.) Estimated cost of repairing both the north and south piers in stone masonry	152,405 04

II. FOR EXTENDING THE SOUTH PIER FOUR HUNDRED AND EIGHTY FEET TO THE EAST.

This will require the addition of 15 cribs to the present south pier, each 32 feet long, 20 feet wide, and 15 feet high from the bottom to the surface, or 20 feet high from the bottom to the flooring at top.

These cribs should be constructed in accordance with the drawings given in the detail on sheet G No. 20, now in the Topographical Bureau, and also in the archives of the United States Senate at Washington, being case 2 of my plans of crib work.—(See also the specifications contained in the table T 2, at pp. 16 to 18 of Senate Ex. Doc. No. 16 of the 34th Congress, 3d session, and the formula of computation at page 15 of the same document.)

The cost of one such crib will be as follows, viz:

For 2,419 lineal feet of pine timber, hewed or sawed, 1 foot square, at 17 cents per lineal foot	$411 23
For 880 lineal feet of white oak timber, hewed or sawed, 1 foot square, at 19 cents per lineal foot	167 20
For 1,482 feet, board measure, of white oak plank, 3 by 8, flooring, at $20 per M	29 64
For 3,167 pounds of 1 inch square wrought iron for bolts, at 4 cents per pound	126 68
For 137 pounds of wrought iron spikes, $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, $7\frac{1}{2}$ cents per pound	10 28
For $63\frac{1}{2}$ cords of hard stones for crib ballast, at $8 per cord of 128 cubic feet	508 00
For labor, carpentry, sinking in position, and filling with stone, and superintendence	500 00
Sum	1,753 03
Add 10 per cent. for contingencies	175 30
Estimated cost of 1 crib	1,928 33
(II.) Then 15 cribs, at $1,928 33 each, gives as the cost of extending the south pier of Chicago harbor 480 feet to the east	28,924 95

III. For a basin to protect the public property and for building cribs.

The United States possess no grounds nor conveniences for construction, nor for protecting the harbor property, such as the steam dredging machine, floating pile-drivers, scows, boats, timber, &c.

It is proposed to provide such a protection by building a basin at the angle formed by the south harbor pier and the Illinois Central Railroad Company's pier, to occupy the position drawn in red on the accompanying three copies of map G No. 52. The basin here represented is 320 feet long by 100 feet wide, and would communicate with the Chicago river by means of an opening to be made in the south pier 35 feet wide.

For the construction of such a basin there will be required 420 lineal feet of crib work, to be built in water of ten feet average depth. Hence there will be required the equivalent of 13⅛ cribs, each 32 feet long by 20 feet wide, and 15 feet high from bottom to top. It is proposed to construct them in accordance with case 2d of crib work, and the specifications contained in table T 2, to be found at pages 16 to 18 of my report No. 116, as printed in Senate Executive Doc. No. 16 of the 34th Congress, 3d session; and as also shown on sheet marked "G, No. 20," now in the Topographical Bureau, and in the archives of the United States Senate.

Estimate of the cost of one such crib.

For 1649 lineal feet of pine timber, hewed or sawed 1 foot square, at 17 cents per lineal foot	$280 33
For 880 lineal feet of white oak timber, hewed or sawed 1 foot square, at 19 cents per lineal foot	167 20
For 1482 feet, board measure, of white oak plank, 3 by 8, for flooring, at $20 per M	29 64
For 2,322 pounds of 1 inch square wrought iron, for bolts, at 4 cents per pound	92 88
For 137 pounds of wrought iron spikes, ⅜ by ⅜ of an inch square, at 7½ cents per pound	10 28
For 46½ cords of ballast stone, at $8 per cord	372 00
Cost of materials for one crib	952 33
For labor, carpentry, sinking in position, and filling with stone, and superintendence	300 00
Sum	1,252 33
Add 10 per cent. for contingencies	125 23
Estimated cost of one crib	1,377 56
(III.) Then 13⅛ cribs, at $1,377 56 each, give for the cost of this basin	18,080 47

IV. *For a steam dredge boat and scows for Chicago harbor.*—This estimate will be found in full detail at pp. 334 and 345 of my report, as printed in Senate Doc. No. 16 of the 34th Congress, 3d session. It amounts to $17,500 00

V. *For dredging Chicago harbor and bar.*—For the excavation and removal of twenty-two thousand cubic yards of sand, at 10 cents per cubic yard $2,200 00

VI. For a set of meteorogical instruments, as per item marked 6 of my report for 1856, printed at page 335 of the aforesaid Senate document $232 50

RECAPITULATION OF ITEMS.

1. For repair of piers in stone masonry	$152,405 04
2. For extending the south pier 480 feet east	28,924 95
3. For a basin for protection of the public property, &c.	18,080 47
4. For a steam dredge, and four scows, for Chicago harbor	17,500 00
5. For dredging Chicago harbor and bar	2,200 00
6. For a set of meteorogical instruments	232 50
Amount of estimate	219,342 96

J. D. GRAHAM,
Major Top. Corps of Eng's, B't Lt. Col. Superintending Engr.
Colonel J. J. ABERT,
Chief Topographical Engineers, Washington.

A 2.

Second bond of the Illinois Central Railroad Company to the United States, and conditions in reference to the second opening in the United States south pier of Chicago harbor, for the said company's benefit, 1858. *(Recorded in book No.* 40 *of mortgages, on page* 205. *The map of reference recorded in book* 143, *page* 0—*that is to say the page next preceding page* 1, *in the office of the Recorder of Cook county, Illinois.*

Know all men by these presents, that the Illinois Central Railroad Company doth hereby acknowledge itself to owe and to be indebted unto the United States of America, in the penal sum of two hundred thousand dollars, lawful money of the United States; for the payment of which said sum, well and truly to be made it doth hereby bind itself, its successors, and assigns, solemnly and firmly by these presents.

In witness whereof, the said company has caused this bond to be

signed by its president and treasurer, and its corporate seal to be thereunto affixed at their office, at the City of Chicago, this twenty-first day of May, one thousand eight hundred and fifty-eight.

Now, the condition of the above obligation is such, that whereas the said United States of America hath, upon the application of the said company, consented to allow the said company to make a second opening in the United States south pier of the harbor of Chicago, to communicate with the said company's proposed second ship basin, adjoining their depot grounds and grain houses at Chicago, in consideration of which said consent, the said company hath agreed, and doth by these presents agree to keep, observe, and perform certain terms, conditions, stipulations, and agreements, deemed essential by the United States to the future security, safety, and accommodation of the navigation and commerce of the people of the United States, carried on at the said Chicago, and the future security and permanence of the public works and harbor at Chieago, and embodied and contained in certain articles of consent and agreement, bearing even date with these presents, to which reference is hereby made, which said articles are mutually signed, and triplicated by the respective parties hereto through their authorized agents.

Now, therefore, if the said Illinois Central Railroad Company shall well and truly on its part keep, observe, perform, and comply with the terms, stipulations, covenants, and conditions, and agreements contained in the said articles, upon its part to be kept and performed, and every part thereof, according to the true spirit and meaning and intent of said articles and the conditions thereof, then, and in that case, the above obligation to be void, otherwise to remain in full force and virtue.

The Illinois Central Railroad Company, by

[SEAL.] W. H. OSBORN,

President of the Illinois Central R. R. Company.

J. N. PERKINS,

Treasurer of the Illinois Central R. R. Company.

These articles of consent and agreement, made and concluded this twenty-first day of May, one thousand eight hundred and fifty-eight, by and between the United States of America, acting through the War Department of the United States, of the one part, and the Illinois Central Railroad Company of the other part,

Witness, that upon the express application of the said Illinois Central Railroad Company for permission to cut a second opening from the depot grounds at Chicago, through the south pier of the Chicago harbor, for a communication with the said company's proposed second ship-basin, adjoining the said depot, the said United States of America hath consented to grant and does hereby grant such permission, upon the express reservations, conditions, and terms hereinafter expressly stated and set forth, to be well and truly kept, complied with, observed, and performed by the said Illinois Central Railroad Company, with this express reservation, however, that upon failure at any time by the said company to so keep, comply with, and

observe and perform the terms and conditions herein contained, and every part thereof to be kept and performed, that the said United States may revoke such consent so, as aforesaid expressly granted, and that in such case the said Illinois Centrai Railroad Company seall be at all the expense of closing such opening in the said pier, and of properly restoring the said pier and harbor in as good and perfect condition to the United States as the same were in before the grant of such permission was made; and that such closing shall be made and carried on under the direction, orders and supervision of such engineer or engineers as shall be designated for that purpose by the War Department of the United States.

And whereas, in consideration of such grant of the permission so given by the United States, as aforesaid, to the said company, it is deemed essential by the United States to the future security and permanence of the harbor and public works of Chicago, and also to the future security, safety, and accommodation of the navigation and commerce of the peoplc of the United States, carried on and to be carried on at Chicago, that the said consent should only be made upon the conditions, terms, stipulations, reservations, agreements, and covenants, herein expressly agreed to, reserved, and contained on the part of the company:

Now, therefore, the said Illinois Central Railroad Company, in consideration as aforesaid, doth hereby expressly promise, agree, and stipulate to and with the United States, as follows, to wit:

1st. That before any proceeding towards a second breach or opening in the said south pier is commenced, the said company shall have closed the walls or crib-work of their ship basin on all sides, in such manner as to render them sufficiently water-tight to prevent any current between the said ship basin and Lake Michigan, and also so as to prevent any current and any water communication between the said ship basin and any other basin which may have an open communication with the said lake.

2. That there shall never be made any other opening or water communication between the said ship basin and Chicago river than that now granted through the said south pier of the said harbor at the point marked F, on the chart marked "Map G, No. 43," hereunto attached, without the express consent, previously obtained, of the War Department of the United States, in writing, upon such further conditions as may be mutually assented to and agreed upon.

3. That upon a good and sufficient communication along the said south pier shall be constructed across the said second opening therein, by means of a drawbridge moving on iron wheels or rollers, and running on an iron railway, whose direction shall be in the prolongation to the east of the present direction of that portion of the south pier which lies eastward of the said proposed second opening, as shown on the said Map G, No. 43, herteo attached.

4. That there shall be constructed at each extremity of the said second opening in the south pier, a good and sufficient abutment pier for the support of the said drawbridge, and that these two abutment piers shall be of masonry, resting at a depth of two feet below the

level of the surface of the water at its lowest ascertained state at the point in question, upon piles; the said drawbridge and abutment peirs to be in accordance with such dimensions, plan, and specifications as shall be approved by the Topographical Bureau, and sanctioned by the War Department of the United States.

5. That the aforesaid second opening in the south pier shall not progress or be carried on until such time as shall be previously recommended by the Topographical Bureau and approved by the War Department of the United States.

6. That the expenses of making the aforesaid second opening and the drawbridge, and the two abutment piers, and all their appurtenances, shall be borne by the said Illinois Central Railroad Company, its successors and assigns, and shall be carried on under the direction, control and supervision of such engineer or engineers as shall be designated by the War Department of the United States, whose duty it shall be to adhere and conform to the dimensions, plan, specifications aforesaid.

7. That all repairs and renewals of any part or the whole ef the aforesaid work shall always, and at all times, be at the expense of the said Illinois Central Railroad Company and their successors and assigns, and in accordance with such plan and specifications as shall be approved by the War Department of the United States.

8. That the jurisdiction over and the control of the said drawbridge and abutment piers and all their appurtenances, shall always be vested in the United States in as full a manner as the piers constructed at the expense of the said States; and that they shall always be subject to such rules and regulations in regard to the manner and time of opening and closing the said drawbridge as shall, from time to time, be specified, required, and directed by the War Department of the United States.

9. It shall be at the option of the War Department of the United States, whenever it shall deem any of the conditions and stipulations aforesaid violated on the part of the said Illinois Central Railroad Company, to revoke the permission so as aforesaid granted, and to cause the aforesaid second opening in the south pier to be closed.

10. That in case of such revocation being made, and notice in writing thereof served upon the agent or agents of the said Company at Chicago or New York, the said Illinois Central Railroad Company shall close the said second opening, and restore said pier and harbor in as good and perfect condition as the same were in at the time of the granting of the aforesaid permission; and that upon a failure on the part of the said Company so to do, the War Department of the United States shall proceed and restore the said pier and harbor, and the said Company hereby stipulates and agrees, in such case, to pay all the expenses of such restoration to the United States.

It is hereby further expressly understood, that for a more full and perfect explanation of the conditions, covenants, and agreements of these articles, and the references therein made to the map hereto attached, that the same entitled "Map G, No. 43, Chicago harbor and bar Illinois, from survey made between the 10th and 15th Sep-

tember, 1856, under the direction of Brevet Lieutenant Colonel J. D. Graham, Major United States Topographical Engineers, superintending engineer of Lake Michigan works, showing the ship channel dredged out between April 22d and September 15th, 1856," shall constitute and be regarded as an integral part of these articles to accompany the same; and to which, for greater certainty, reference is hereby expressly made. In testimony whereof, these articles, bearing even date, as above expressed, with the bond hereto prefixed, are signed in triplicate by W. R. Drinkard, Acting Secretary of War, on the part of the United States, with the seal of the War Department hereunto affixed, at Washington, the fourteenth day of July, 1858, and by W. H. Osborn, President, and J. N. Perkins, Treasurer of the said Illinois Central Railroad Company, with the corporate seal of the said Company also hereunto affixed, at their office at the city of Chicago, Illinois, the twenty-first day of May, in the year one thousand eight hundred and fifty-eight.

[SEAL.] W. R. DRINKARD,
Acting Secretary of War.
W. H. OSBORN,
President of the Illinois Central R. R. Company.
[SEAL.] J. N. PERKINS,
Treasurer of the Illinois Central R. R. Company.

No. 5801.

STATE OF ILLINOIS, *Cook County.*

Filed for record August twenty-fifth, A. D., 1858, and recorded in book No. 40 of mortgages, on page 205. Map of reference recorded in book 143, page O.

WM. L. CHURCH,
Clerk of Circuit Court and Ex-Officio Recorder Cook County.

A 3.

Bond of the Chicago Dock and Canal Company, and conditions in reference to an opening in the United States north pier of Chicago Harbor, for the said Company's benefit.

Know all men by these presents, that the Chicago Dock and Canal Company doth hereby acknowledge itself to owe and to be indebted unto the United States of America in the penal sum of two hundred thousand dollars, lawful money of the United States; for the payment of which said sum well and truly to be made, it doth hereby bind itself, its successors, and assigns solemnly and firmly by these presents.

In witness whereof, the said company has caused this bond to be signed by its president and secretary, and its corporate seal to be

thereunto affixed at its office at the city of Chicago, this eleventh day of November, one thousand eight hundred and fifty-eight:

Now, the condition of the above obligation is such that whereas the said United States of America have, upon the application of the said company, consented to allow the said company to make an opening in the United States north pier in the harbor of Chicago, to communicate with the said company's proposed ship basin and canal to adjoin the said north pier of Chicago harbor, in consideration of which said consent the said company hath agreed and doth by these presents agree to keep, observe, and perform certain terms, conditions, stipulations, and agreements, deemed essential by the United States to the future security, safety, and accommodation of the navigation and commerce of the people of the United States, carried on at the said Chicago, and the future security and permanence of the public works and harbor at Chicago, and embodied and contained in certain articles of consent and agreement bearing even date with these presents, to which reference is expressly made, which articles are mutually signed and triplicated by the respective parties hereto, through their authorized agents:

Now, therefore, if the said Chicago Dock and Canal Company shall well and truly on its part keep, observe, perform and comply with the terms, stipulations, covenants, and conditions and agreements contained in the said articles upon its part to be kept and performed, and every part thereof according to the true spirit and meaning and intent of said articles and the conditions thereof, then and in that case the above obligation to be made void, otherwise to remain in full force and virtue.

The Chicago Dock and Canal Company by
MARLON D. OGDEN,
President.

[SEAL.]

FRANKLIN HATHEWAY,
Secretary.

These articles of consent and agreement made and concluded this eleventh day of November, one thousand eight hundred and fifty-eight, by and between the United States of America, acting through the War Department of the United States of the one part, and the Chicago Dock and Canal Company of the other part.

Witness that upon the express application of the said Chicago Dock and Canal Company for permission to open an opening from its proposed ship basin and canal at Chicago through the north pier of the Chicago harbor for a communication with the said company's proposed ship basin and canal to adjoin the said north pier, the said United States of America have consented to grant and do hereby grant such permission upon the express stipulations, conditions, and terms hereinafter expressed, and on the part of the said truly kept, observed, and performed by the said Chicago Dock and Canal Company with the stipulations, covenants, and that upon the [illegible] with, and observe and perform the [illegible]

The [illegible]

tained and every part thereof to be kept and performed, that the said United States may revoke such consent so as aforesaid expressly granted, and that in such case the said Chicago Dock and Canal Company shall be at all the expense of closing such opening in the said pier, and of properly restoring the said pier and harbor in as good and perfect condition to the United States as the same were in before the grant of such permission was made, and that such closing shall be made and carried on under the direction, orders, and supervision of such engineer or engineers as shall be designated for that purpose by the War Department of the United States.

And whereas, in consideration of such grant of the permission so given by the United States, as aforesaid, to the said company, it is deemed essential by the United States to the future security and permanence of the harbor and public works at Chicago, and also to the future security, safety, and accommodation of the navigation and commerce of the people of the United States carried on and to be carried on at Chicago, that the said consent should only be made upon the conditions, terms, stipulations, agreements, and covenants herein expressly agreed to, reserved, and contained.

Now, therefore, the said Chicago Dock and Canal Company, in consideration as aforesaid, doth hereby expressly promise, agree, and stipulate, to and with the United States, as follows, to wit:

1. That before any proceeding towards a breach or opening in the said north pier is commenced, the said company shall have closed the walls or crib works of its ship basin, and canal or canals, and harbors on all sides, and shall continue to keep them and all such of their works closed in such manner as to render them sufficiently water tight to prevent any current between Lake Michigan and the said ship basin, and the said canal or canals, and harbors, and also so as to prevent any current and any water communication between the said ship basin, canal or canals and harbors, and any other basin or water way which may have an open communication with the said lake.

2. That there shall never be made any other opening or water communication between the said ship basin, or between the said canal or canals, or between the said harbors or any of them, and Chicago river than that now granted through the said north pier of Chicago harbor at the point marked A on the chart marked "map G, No. 58," hereto attached, without the express consent, previously obtained in writing, from the War Department of the United States, upon such further conditions as may be mutually assented to and agreed upon.

5. That the said company's basins, canals, and harbors, shall have parapets or walls sufficiently high to prevent the lake waves from washing over them, and from producing a current through them into Chicago river.

4. That a good and sufficient communication along the said north pier shall be constructed across the said opening therein by means of a drawbridge moving on iron wheels or rollers, and running on an iron railway, whose direction shall be in the prolongation of the present direction of that portion of the north pier where the opening shall be made, as shown on the said map G, No. 58, hereto attached.

5. That there shall be constructed, at each extremity of the said opening in the north pier, a good and sufficient abutment pier for the support of said drawbridge, and that these two abutment piers shall be of masonry resting upon piles at a depth of two feet below the level of the surface of the water at its lowest ascertained state, at the point in question; the said drawbridge and abutment piers to be in accordance with such dimensions, plan and specifications, as shall be approved by the Topographical Bureau and sanctioned by the War Department of the United States.

6. That the aforesaid opening in the north pier shall not progress or be carried on, until such time as shall be previously recommended by the Topographical Bureau and approved by the War Department of the United States.

7. That the expenses of making the aforesaid opening, and the drawbridge, and the two abutment piers, and all their appurtenances, shall be borne by the said Chicago Dock and Canal Company, its successors and assigns, and shall be carried on under the direction, control and supervision of such engineer or engineers as shall be designated by the War Department of the United States, whose duty it shall be to adhere and conform to the dimensions, plan and specifications aforesaid.

8. That all repairs and renewals of any part or the whole of the aforesaid work shall always and at all times be at the expense of the said Chicago Dock and Canal Company and its successors and assigns, and in accordance with such plan and specifications as shall be previously submitted to, and approved by the War Department of the United States.

9. That no work constructed or to be constructed by the said company, its successors or assigns, shall interfere with or encroach upon the position which previous to the charter granted by the State of Illinois to the said company, was chosen and adopted by the Light-house Board of the United States, for the erection of the new light-house for Chicago harbor; the said position being in lake Michigan, adjacent to the east end of the north pier of said harbor, and is bounded as follows, to wit: Beginning at the east end of said north pier at the point marked B on the accompanying map G, No. 58, and also marked B on the accompanying "plan of the position of the new light-house and keeper's house for Chicago harbor, with the piers of defence for the same," and running thence north twenty-four degrees and twenty minutes west, one hundred and six feet to the point marked C on the said map and plan, thence north seventy degrees west, one hundred and thirty feet to the point D on the said map and plan, thence south eighteen degrees west, one hundred and twenty two and a half feet to a point marked E on the said map and plan, which point E is on the south face of the said north pier of Chicago harbor; thence along the south and east faces of the said north pier, on the lines E F, F G, G B, to the point of beginning as marked on the said map and plan; the courses here marked being the true courses, as compared with the true meridian and not the magnetic; which said position as above

described and delineated, is the sole property of the United States and their successors and assigns forever.

10. That the jurisdiction over and the control of the aforesaid drawbridge, and abutment piers, and all their appurtenances shall always be vested in the United States, in as full a manner as the piers constructed at the expense of the said States, and that they shall always be subject to such rules and regulations in regard to the manner and time of opening and closing the said drawbridge as shall from time to time be specified, required and directed by the War Department of the United States; and that the said opening and closing shall be done by or at the expense of the said Chicago Dock and Canal Company.

11. That it shall be at the option of the War Department of the United States when it shall deem any of the conditions and stipulations aforesaid violated on the part of the said Chicago Dock and Canal Company, its successors or assigns, to revoke the permission so as aforesaid granted, and to cause the aforesaid opening in the North pier to be closed.

12. That in case of such revocation being made, and notice in writing thereof served upon the president, or other agent or agents of the said company, the said Chicago Dock and Canal Company shall close the said opening and restore said pier and harbor in as good and perfect condition as the same were in at the time of the granting of the aforesaid permission; and that upon a failure on the part of the said company. its successors or assigns so to do, the War Department of the United States shall proceed and restore the said pier and harbor; and the said company hereby stipulates and agrees in such case to pay all the expenses of such restoration to the United States.

13. It is hereby further expressly understood that for a more full and perfect explanation of the conditions, covenants, and agreements of these articles, and the references therein made to the maps hereto attached, that the same entitled "map G, No. 58, Chicago harbor and bar, Illinois, from survey made between the 17th of August and the 2d of September, 1858, under the direction of Brevet Lieutenant J. D. Graham, major United States Corps of Topographical Engineers, superintending engineer of Lake Harbor works," and map G, No. 59, "Plan of the position of the new light-house and keeper's house for Chicago harbor, with the piers of defence for the same, by Brevet Colonel J. D. Graham, superintending engineer of Chicago light-house," shall constitute and be regarded as integral parts of these articles, to accompany the same, and to which for greater certainty, reference is hereby expressly made.

In testimony whereof these articles bearing even date as above expressed with the bond hereto prefixed, are signed in triplicate by the Secretary of War, on the part of the United States, with the seal of the War Department hereunto affixed, at Washington, the —— day of ————, and by Mahlon D. Ogden, president, and Franklin Hatheway, secretary, of the said Chicago Dock and Canal Company, with the corporate seal of the said company also hereunto affixed at

its office, at the city of Chicago, Illinois, the eleventh day of November, one thousand eight hundred and fifty-eight.

[Seal of the War Office.] ——— ———,
Secretary of War.

[Seal of the Chicago Dock and Canal Company.] MAHLON G. OGDEN,
President of the Chicago Dock and Canal Company.

FRANKLIN HATHEWAY,
Secretary of the Chicago Dock and Canal Company.

STATE OF ILLINOIS,
County of Cook, City of Chicago, } *ss.*

I, Charles R. Sheldon, a notary public in and for said city, in the county and State aforesaid, do hereby certify that Mahlon D. Ogden, president of the Chicago Dock and Canal Company, and Franklin Hatheway, secretary of said company, who are personally known to me as such, appeared before me this day in person, and acknowledged the foregoing bond and the articles of agreement thereto attached to be their free act and deed, for and in behalf of the said Dock and Canal Company, and that the seal attached thereto is the seal of the said company.

[Notarial seal.] Witness my hand and notarial seal, this 11th day of November, in the year 1858.

CHARLES R. SHELDON,
Notary Public.

2. WAUKEGAN BREAKWATER, ILLINOIS.

My annual report, No. 116, for the year 1855, contains full information in regard to this work, with an estimate in full detail of its cost under the proposed plan, amounting to $137,966 10.

That report is printed in Senate Ex. Doc. No. 16 of the 34th Congress, 3d session, at pages 127 to 140.

My report for the following year (1856) is printed in part 2 of the same document, at pages 337 and 338.

As no work has been carried on there since that period, owing to no appropriation having been made since the year 1852, I beg leave to refer to those reports as containing all the information I have to offer on this subject.

A map of reference, marked G No. 29, on a scale of $\frac{1}{2400}$, or two hundred feet to one inch, with the proposed improvement drawn thereon, was sent in duplicate to the Topographical Bureau, with my report for 1855, one of which was sent to the United States Senate.

There is a balance of three hundred dollars ($300) remaining in hand of the appropriation for this work, which is due to Sweet, Ives & Hawley for wrought iron delivered by them under contract before I was put in charge of these lake harbor works, and which has been used for bolts in constructing cribs.

They were long ago invited by me to come forward and execute a lawful voucher upon which I could pay them the amount, but they

have failed to do so. The money awaits their proceedings on this point.

3. KENOSHA HARBOR, WISCONSIN.

No balance remains of the last appropriation (made in 1852) for this harbor, and no work has been carried on there since the year 1855.

The improvements required to be made there are fully described in my reports for the years 1855 and 1856, which are printed in the above-mentioned Senate document, at pages 140 to 180 and 338 to 339. The estimates, in full detail of items, are printed at pages 173 to 177, amounting in all to the sum of $58,047 24.

The amounts under the different heads are as follows, viz:

1. For the protection of the harbor from a deposit of the drifting sand blown across the piers into the channel	$750 00
2. For the extension of the harbor piers	19,096 88
3. For dredging necessary to produce a depth of 12 feet over the bar, and between the United States piers, and also a depth of 10 feet in the proposed channel EF, (see maps G, Nos. 30, 42 and 53, in the Topographical Bureau, and also in the archives of the United States Senate,) this channel to be 600 feet long and 160 feet wide	8,464 80
4. For deepening the basin to 10 feet, west of the United States piers	9,669 22
5. For increasing the capacity of this basin, by deepening its north and west arms to 10 feet	20,065 34
Amount of appropriation required to complete Kenosha harbor, Wisconsin	58,047 24

I recommend that the above sum be granted in one appropriation, as it can be judiciously expended for the objects stated in one year, or at farthest in a year and a half, and it is for the completion of this harbor.

4. RACINE HARBOR, WISCONSIN.

No balance remains of the last appropriation (of 1852) for this harbor. It was expended in the year 1855, as stated in my previous reports.

My annual report for 1857 gives a full account of the condition of this harbor, up to September 30 of that year.

I consider the pier extensions recommended in that report as very necessary, and for that object I beg leave to renew here my estimate given in detail at page 63 of Senate Ex. Doc., No. 42, of the 1st session of the 35th Congress, amounting to the sum of $17,422 73

To this should be added:

For raising the piers to five feet above the present level of Lake Michigan, equal so seven feet above the ordinary level of this lake	$3,500 00
For dredging 15,000 cubic yards, at 30 cents	4,500 00
Amount required for Racine harbor, Wisconsin	25,422 73

I recommend that this sum be granted in one appropriation.

Racine has completed her railroad connexion with the Milwaukee and Mississippi railroad, and thence with the Mississippi river at Prairie du Chien.

Very soon another connexion with the Mississippi river at Savanna will be completed. This last line has already been extended from Racine to Durand, in the State of Illinois.

These improvements have already greatly increased the quantity of agricultural products carried to Racine for shipment eastward, and also the supply of goods brought from the east and distributed through the western country. Hence it is very important, both to the agricultural and commercial interests of that region of country, that the improvements of the harbor of Racine should be completed as soon as possible.

A great error has heretofore prevailed in the assigned position of Racine, and hence in regard to its proximity to Milwaukee, the next harbor to the north.*

On the 6th of September last I inspected this harbor, and at night made the following observations with a sextant and time piece No. 1, (sidereal) for ascertaining the latitude and longitude.

The position occupied was two hundred and ninety-seven (297) feet N. 87° 05′ E. from the centre of the dome of the court-house of Racine.

1. *For the Time.*

	h. *m.* *s.*
Time-piece No. 1, fast of Racine sidereal time:	
By 9 observations on *a* (Alpha) Andromedæ, E	1 07 37.1
By 13 observations on *a* (Alpha) Coronæ borealis, W	1 07 46.7
Result for the Time: Time-piece No. 1, fast of Racine sidereal time, Sept. 6, 1858, at (19*h.* 46*m.*)	1 07 36.9

On the 5th and 7th of September the time was observed with time-piece No. 1, (sidereal) at station No. 3, (on Huron street, Chicago,) given in the preceding table of latitudes and longitudes of positions in that city, viz:

*See Senate debates, at page 1678 (right hand column) of part 3d of the Congressional Globe for 1856, 34th Congress, 1st session.

1. 1858, *September* 5. Time piece No. 1, fast of Chicago sidereal time:

	h. m s.
By observations on *a* (Alpha) Coronæ borealis, west	1 06 53.8
By observations on *a* (Alpha) Andromedæ, east	1 06 54.7
Result for the Time: Time-piece No. 1, fast of Chicago sidereal time, Sept. 5, 1858, (at 19*h.* 45*m.*)	1 06 54.25
By comparison: Time-piece No. 2 was slow of Chicago mean solar time, (at 8*h.* 45*m.* mean solar,) the same night	0 04 28.5

2. 1858, *September* 7. Time-piece No. 1, fast of Chicago sidereal time:

By 9 observations on *a* (Alpha) Andromedæ, east				1 07 06.7
	h.	m.	s.	
By 15 observations on *a* (Alpha) Lyræ, W.	1	07	06.51	
By 8 observations on *a* (Alpha) Aquilæ, W.	1	07	06.53	
By 23 observations on *a* Lyræ and *a* Aquilæ, west				1 07 06.5
Result for the Time: Time-piece No. 1, fast of Chicago sidereal time, September, 7, 1858, (at 21*h.* 23*m.*)				1 07 06.62
By comparison: Time-piece No. 2, was slow of Chicago mean solar time, (at 10*h.* 15*m.* mean solar,) the same night				0 04 28.36

Daily Rates, from September 5th to September 7th, 1858:
No. 1, sidereal, +6*s.*, on sidereal time.
No. 2., mean solar, +0.07*s.*, on mean solar time.

The above rates will be presently used, in connection with a comparison of Racine time with Chicago time, in order to obtain the difference of longitude between these two places, by means of electric signals transmitted forth and back along the telegraph wires. For this purpose, time-piece No. 2 (mean solar) remained at Chicago.

We now continue the observations at Racine.

2. *For the Latitude of Racine.*

LATITUDE OF STATION.

By 11 circum-meridian altitudes of Altair (a Aquilæ) S.	42° 43′ 43″.2
By 11 circum-meridian altitudes of γ (Gamma) Cephei, N.	42° 43′ 46″.3
Result. Latitude of station	42° 43′ 44.″7

3. *For the Longitude of Racine.*

Between the observations on *a* (Alpha) Andromedæ, east, for the time, and γ (Gamma) Cephei, north for the latitude, the following time-signals were passed by the electric telegraph between Chicago

and Racine to obtain the difference of longitude between the observing stations at the two places.

The times of the signals were recorded at Chicago by the mean solar time-piece No. 2, which was left there for the purpose, and they rest on the accuracy of the observations made there for the time on the 5th and 7th of September, as above given, and on the rate of that time-piece during an elapsed time of twenty-six hours.

The same signals were recorded at Racine by the sidereal time-piece No. 1, resting on the accuracy of the observations made for the time there immediately preceding those signals and the rate of that time-piece for about two hours.

A few experimental signals were, in the first place, made to obtain satisfactorily the period of a coincidence of beats or clicks between the two time-pieces. This accomplished, it was easy, by applying the rates of the two time-pieces and the gain of sidereal on mean solar time, to give signals at Racine that should avoid fractions of a beat at either station, and also to name the moments that signals should be made at Chicago by the time-piece there that would equally avoid such fractions in recording the signals by the two time-pieces.

In this way neither the eye nor the ear were taxed to estimate the value of fractions of a beat. The fractions of a second of time, if any, attaching to the deduced difference of longitude between the meridians of the two stations are given by exact computation in reducing the sidereal time recorded at Racine to its equivalent mean solar period, in order to a direct comparison with the mean solar time actually recorded at Chicago; or, *vice versa*, in reducing the mean solar time recorded at Chicago to its equivalent sidereal period preparatory to a comparison with Racine sidereal time, as actually recorded there by time-piece No. 1.

The following is a record of the signals made at the two stations, with the results carried out, and showing the difference of longitude deduced from each.

Determination of the difference of longitude between Chicago and Racine by electric signals for comparisons of time, September 6, 1858.

1.—CHICAGO SIGNALS RECORDED AT BOTH STATIONS.

Times of signals given at Chicago by mean solar time-piece, No. 2.	Time-piece No. 2, slow of Chicago mean solar time.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Racine by sidereal time-piece, No. 1.	Time-piece No. 1 fast of Racine sidereal time.	Racine correct sidereal time of Chicago signals.	Chicago correct sidereal time of Chicago signals.	Difference of longitude by each signal; Racine west of Chicago.
h. m. s.	m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
11 16 50	4 28.42	11 21 18.42	23 32 17.5	1 07 37.55	22 24 39.95	22 25 16.75	0 00 36.80
11 19 40	4 28.42	11 24 08.42	23 35 08	1 07 37.57	22 27 30.43	22 28 07.22	36.79
11 31 40	4 28.42	11 36 08.42	23 47 10	1 07 37.62	22 39 32.38	22 40 09.19	36.81
11 34 42	4 28.42	11 39 10.42	23 50 12.5	1 07 37.63	22 42 34.87	22 43 11.68	36.81
11 37 41	4 28.42	11 42 09.42	23 53 12	1 07 37.64	22 45 34.36	22 46 11.17	36.81

1st Mean.—Electric fluid transmitted from Chicago to Racine ..... 0h. 00m. 36s.804.

II.—RACINE SIGNALS RECORDED AT BOTH STATIONS.

Times of signals given at Racine by sidereal time-piece No. 1.	Time-piece No. 1, fast of Racine sidereal time.	Times of Racine signals, as noted at Chicago by mean solar time-piece No. 2.	Time-piece No. 2 slow of Chicago mean solar time.	Chicago correct mean solar time of Racine signals.	Chicago correct sidereal time of Racine signals.	Racine correct sidereal time of Racine signals.	Difference of longitude—Racine west of Chicago.
h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
23 38 8.5	1 7 37.58	11 22 40.00	4 28.42	11 27 8.42	22 31 7.71	22 30 30.92	0 0 36.79
23 41 09	1 7 37.59	11 25 40.00	4 28.42	11 30 8.42	22 34 8.20	22 33 31.41	36.79
23 44 10.5	1 7 37.60	11 28 41.00	4 28.42	11 33 9.42	22 37 9.69	22 36 32.90	36.79

	h. m. s.
2d Mean.—Electric fluid transmitted from Racine to Chicago	0 0 36.79
1st Mean.—Electric fluid transmitted from Chicago to Racine, as above	36.804
Result: Racine west, in longitude of Chicago, by a mean of the two sets of signals	36.8
Latitude of the observing station for the time at Chicago, resting on—1st, Lieutenant Colonel Graham's determination of the longitude of the centre of the citadel of Quebec in November, 1842, = 4*h*. 44*m*. 49*s* 65; 2d, difference between Quebec and Chicago, as determined by electric signals in May, 1857	5 50 31.2
Longitude of the observing station at Racine, west of Greenwich	5 51 8.0

Position of the observing station at Racine, as above determined.

	° ′ ″
Latitude	42 43 44.7
	h. m. s.
Longitude, west of Greenwich, in time	5 51 08.0
	° ′ ″
Do.....do.....do....in arc	87 47 00.0

By measured azimuths with a theodolite, and distances with a chain, from the above observing station, we obtain, for more convenient reference, the positions of the following permanent objects at Racine, viz:

Positions in the City of Racine.	Latitude north.	Longitude west of Greenwich.	
		in time.	In arc.
	° ′ ″	h. m. s.	° ′ ″
1. Dome of the court-house, situated between 5th and 6th streets, and 100 feet west of the west margin of Main street	42 43 44.6	5 51 8.26	87 47 4.0
2. The tower of St. Luke's church, (Episcopal)	42 43 45.4	5 51 8.06	87 47 1.0
3. The steeple of the Universalist church of the Good Shepherd	42 43 44.3	5 51 8.06	87 47 0.9

The signals at Racine were all made by myself. To one who has had much practice in counting the beats of a chronometer for the purpose of noting the time of an observation, it is not so difficult, as might be supposed, to make these telegraphic signals in close—*exact*, I may almost say—coincidence with any given beat of a chronometer. I think it will be found that the accuracy of signals made in this way, for time comparisons between two distant stations where a sidereal time-piece is used at the one and a mean solar at the other, approaches very near to that which is secured by a self-recording clock which gives the signals by the action of its pendulum in breaking the electric circuit.

The signals at Chicago were made by an experienced telegraph operator there, after having been carried through a course of practice in making signals to correspond with the beat of the chronometer at every ten (10) seconds of interval.

The tabulated results given above of the difference of longitude between the two stations by the several signals will serve to show the degree of accuracy that may be attained in this way.

It will be seen that the extreme difference in the results for the longitude, from the eight signals that were passed, is only .02, or $\frac{1}{50}$ (one-fiftieth) of a second of time, although the correction for *rate* of one of the time-pieces incorporated in the calculation amounted in the extreme to .09, or $\frac{9}{100}$ (nine one-hundredths) of a second of time.

The position of Racine is given by Captain T. J. Cram from astronomical observations by himself, in his report on his survey of 1841, of the boundary line between Michigan and Wisconsin, as follows:

	Latitude north.	Longitude west of Greenwich.
Racine, Wisconsin Territory, (west shore of Lake Michigan).	42° 49′ 33″	87° 40′ 22″

(See Senate Doc., No. 170, of the 27th Congress, 2d session, page 7,) which places it too far north in latitude + 5′ 48,″ and too far to the east in longitude — 6′ 42.″

This is an absolute error in geographical position of eight and three-fourths ($8\frac{3}{4}$) miles, on a course of N. 40° 25′ E. from the true position, and affects the distance to the next harbor, as will be presently shown.

5. MILWAUKEE HARBOR, WISCONSIN.

The whole of the appropriation of 1852 for the improvement of this harbor has been expended, as heretofore reported.

For a full report upon the importance of this harbor, both in a military and a commercial point of view, I beg leave to refer to my previous reports printed in Senate Executive Document No. 16, of the 34th Congress, 3d session, and No. 42 of the 35th Congress, 1st session.

My annual report for 1857, contained in the last mentioned document, shows the condition of this harbor on the 30th of September of that year in regard both to the new harbor at the "North Cut" and the old or original harbor at the natural entrance of Milwaukee river. I will now proceed to state what has since been done at each and the condition of each at the present time.

1. *The new harbor at the "North Cut."*

The piers for the formation of this new harbor were reported on the 30th of September last, as completed to the necessary depth out into the lake. Since that time there has been placed at the lakeward, or east extremity of each of these piers, a crib 32 feet square, ranging centrally with the middle line or axis of the piers. They are designed to serve as pier-fenders in the case of collision by vessels in entering the harbor in dark weather during heavy northeasterly winds. These pier-fenders lie in 14 feet depth of water, and are built up to a height of eight (8) feet above the level of the lake surface, as it was in November, 1857. They are strongly built and bolted after the plan shown in the sheet of drawings, marked G, No. 20, now in the Topographical Bureau, and in the specifications for case 2d of crib work, contained in pages 8 to 12, and 16 to 18 of Senate Executive Doc., No. 16 of the 34th Congress, 3d session.

The interior or river faces of the new piers forming the new harbor have also been defended against the collision of vessels coming in

under strong winds, and from their chafing while lying along side. This has been done by longitudinal stringers of oak timber hewn or sawed one foot square, which are bolted to the pier timbers one foot above the present water level. They are made to occupy, consecutively, the spaces between the interior oak piles which are marked *e e e*, in figures 4 and 5 (four and five) in each of the sheets of drawings, showing our method of crib work, now in the Topographical Bureau, and in the archives of the Senate, marked G, Nos. 19, 20, and 21.

The United States steam dredge for Lake Michigan, continued her operations in dredging this new harbor, from the date of my last annual report (September 30, 1857,) to the 16th of November of that year.

Her operations were resumed on the 8th of May, and continued until the 27th of July, 1858. During these two working periods she excavated and removed 49,120 cubic yards. This added to the 32,404 cubic yards* excavated and removed previous to October 1, 1857, as before reported, makes the total quantity excavated and removed in 1857 and 1858, for the creation of this new harbor by the United States dredge, 81,524 cubic yards.

An account of each day's work done since October 1, 1857, and a recapitulation showing all that was done both in 1857 and 1858, by the United States dredge-boat, is given in the accompanying statement marked B 1.

Besides this a large amount of dredging has been done in both seasons by scoop dredges employed under the city contract, in deepening this new harbor and the channel of the river above.

The great benefit of these improvements is shown by the facilities with which the largest class of lake vessels enter and leave this new harbor, and by the greatly increased commerce of the port of Milwaukee.

At this time, fourteen (14) feet can be carried from the harbor entrance, through the whole width and length of the channel formed by the new piers, thence through the cut which connects with the river, and thence up the river for a distance of one mile above the cut. It must be remembered, however, that the lake is now full two (2) feet higher than its mean stage. At the mean stage, then, the depth throughout would be reduced to twelve (12) feet.

2. *The old harbor at the natural mouth of Milwaukee.*

The importance of keeping up this old harbor at the natural entrance of Milwaukee river, is fully exposed in the reports of the late Board of Topographical Engineers, of May 28, 1843, and March 4, 1854. The first will be found printed in Senate Ex. Doc. No. 1, of the 33d Congress, 1st session, part 3d, pp. 183 to 186; and the second in Senate Ex. Doc. No. 1, of 33d Congress, 2d session, part 2, page 237.

* See Senate Ex. Doc. No. 42, of the 35th Congress, 1st session, page 65.

In regard to our own views, they were, after careful examination of the subject based on a careful survey, fully expressed in our annual report (No. 116,) of December 31, 1855.—(See p. 206 of Senate Ex. Doc. No. 16, of the 34th Congress, 3d session.) Further observation of the natural advantages of this harbor, combined with the rapidly increased commerce of Milwaukee, induce us to reiterate here the expression of the same views.

I regret to have to report that the piers for the protection of this old harbor, have, since the period of my last annual report, been almost entirely destroyed from their rotten condition, and the action of the winter, ice, and storms. This fate was predicted in that report unless an appropriation was soon made for their repair.—(See Senate Ex. Doc. No. 42, of the 35th Congress, 1st, session, pp. 67 and 68.)

The south pier is almost entirely swept away above the water level. All that remains of it is the skeleton appearance afforded by some of the upright piles, and some irregularly scattered timbers which protrude their heads above water.

The condition of the north pier is not much better.

The consequence of this state of ruin is that the sea breaks through when the winds are from the eastward, and extends its waves far within the natural entrance of the river, and there deposits the sand carried along.

A shoal has thereby been formed which diminishes the depth there to from three to nine (3 to 9) feet at the present high stage of the lake surface. At the ordinary or mean stage of the lake, there would be only from one to seven (1 to 7) feet.

Throughout that part of the river included between the new and the old harbor, the depth has become much diminished, and unless soon attended to, a very valuable roadstead or anchorage will be totally lost to Milwaukee.

A breach two hundred and fifty-six (256) feet long has been made through the promontory or land strip, which formed the eastern shore of the river here, and protected the channel of the river from the lake sea.

The depth of this breach is about six (6) feet in the middle, and unless stopped by crib-work, it will become wider from the continued action of the same force at the present high stage of the lake, and this valuable barrier may be destroyed.

To stop this breach and thus check its progress, will require a line of crib-work two hundred and fifty-six (256) feet long, with an average of four (4) feet depth in the water, or a height of nine (9) feet from bottom to top.

For these repairs, and for dredging, I submit the following estimates, viz :

1. For repairs of the north and south piers, I offer the estimate contained in my last annual report ; (see pp. 71 and 72 of Senate Doc. No. 42, 35th Congress, 1st session) amounting to $28,630 41

2. For repairing the breach in the land strip which separates the lower part of Milwaukee river from Lake Michigan, as per the accompanying estimate marked B 2	$4,290 16
3. For dredging, I offer the estimate marked B 4, at pages 72 and 73 of the same Doc. amounting to,	11,710 85
Amount required for repairing the harbor at the natural mouth of Milwaukee river	44,631 42

I would recommend the granting of this sum in one appropriation.

The latitude and longitude of Milwaukee.

As Milwaukee is one of the principal harbors on Lake Michigan, whether considered in point of importance as a harbor of refuge for the accommodation of the lake navigation generally, or in reference to the value of its own local commerce and navigation, it seems essential that its geographical position, and hence its relative position to other harbors, should be correctly laid down upon a reference map which I hope, before long, to be able to present, of reliable authority for the object stated.

For this purpose I carried my portable instruments with me on my late tours of inspection of the harbor, and of the operations of the United States steam dredge, and after the day's duties were over, made the following observations at night, viz:

As the longitude was to be obtained by comparisons with the meridian of Chicago, already well established, from Greenwich, the time corresponding to that meridian was the initial element in the operation. I will begin therefore by giving in a brief form, the results of the observations made there for the time.

The same instruments were used as before described.

Observations for the time at Chicago.

The station occupied was 179 feet west of the meridian and 24 feet north of the parallel of the observing station of May, 1857, already described under the head of Chicago harbor. It is the station marked No. 2 in the table of positions in Chicago. It is in latitude 41° 53′ 50″.5 N.; longitude west of Greenwich 5*h*. 50*m*. 31*s*.15=87 37′ 47″.2.

1. 1858, June 22.—Time piece No. 1 fast of Chicago sidereal time for this station:	
By fourteen observations on *α* (Alpha) Lyræ, E	0*h*. 59*m*. 30*s*.09
By sixteen observations on *α* (Alpha) Bootis, W	0*h*. 59*m*. 30*s*.53
Result: Time piece No. 1 fast of Chicago sidereal time, June 22, 1858, (at 15*h*. 52*m*.)	0*h*. 59*m*. 30*s*.07
By comparison: Time piece No. 2 was slow of Chicago mean solar time (at 9*h*. 48*m*. mean solar) same night	4*m*. 56*s*.33

2. 1858, June 28.—Same station.—Time-piece No. 1 fast of Chicago sidereal time for this station:

By ten observations on *α* (Alpha) Lyræ, E	1*h.* 00*m.* 07*s.*92
By twelve observations on *α* (Alpha) Bootis, W	1*h.* 00*m.* 07*s.*20
Result: Time-piece No. 1 fast of Chicago sidereal time, June 28, 1858, (at 12*h.* 52*m.*)	1*h.* 00*m.* 07*s.*56
By comparison: Time-piece No. 2 was slow of Chicago mean solar time (at 9*h.* 25*m.*) same night	4*m.* 53*s.*75

Mean daily rates from June 22 *to June* 28, 1858.

No. 1, sidereal, +6*s.*14 per sidereal day.
No. 2, mean solar, +0*s.*76 per mean solar day.
At Chicago station No. 3, (see table,) in latitude 41° 53′ 46″.3 N.; longitude 5*h.* 50*m.* 31*s.*2 W.

3. 1858, June 30.—Time-piece No. 1 fast of Chicago sidereal time for this station:

By ten observations on *α* (Alpha) Coronæ Borealis, W.	1*h.* 00*m.* 21*s.*22
By thirteen observations on *α* (Alpha) Andromedæ, E.	1*h.* 00*m.* 20*s.*48
Result: Time-piece No. 1 fast of Chicago sidereal time June 30, 1858, (at 19*h.* 45*m.*)	1*h.* 00*m.* 20*s.*85
By comparison: Time-piece No. 2 slow of Chicago mean solar time (at 13*h.* 09*m.*) same night	4*m.* 53*s.*1

4. At station No. 2 (see Chicago table) in longitude 5*h.* 50*m.* 31*s.*15 W.

1858, July 3.—Time-piece No. 1 fast of Chicago sidereal time for this station:

By six observations on *α* (Alpha) Lyræ E	1*h.* 00*m.* 36*s.*95
By twelve observations on *α* (Alpha) Cygni, also E	1*h.* 00*m.* 37*s.*40
By a mean from two east stars	1*h.* 00*m.* 37*s.*17
By fourteen observations on *α* (Alpha) Bootis, W	1*h.* 00*m.* 37*s.*03
Result: Time-piece No. 1 fast of Chicago sidereal time July 3, 1858, (at 16*h.* 40*m.*)	1*h.* 00*m.* 37*s.*10
By comparison: Time-piece No. 2 was slow of Chicago mean solar time (at 9*h.* 53*m.* mean time) the same night	4*m.* 50*s.*53

5. 1858, July 5.—At Chicago station No. 3, (see table of positions,) longitude 5*h.* 50*m.* 31*s.*2 W.

Time-piece No. 1 fast of Chicago sidereal time for this station:

By fourteen observations on *α* (Alpha) Coronæ Borealis, W	1*h.* 00*m.* 50*s.*08
By eighteen observations on *α* (Alpha) Andromedæ, E.	1*h.* 00*m.* 49*s.*97
Result: Time-piece No. 1 fast of Chicago sidereal time July 5, 1858 (at 19*h.* 44*m.*)	1*h.* 00*m.* 50*s.*02
By comparison: Time-piece No. 2 was slow of Chicago mean solar time (at 12*h.* 48*m.*) same night	4*m.* 49*s.*38

6. 1858, July 7.—At Chicago station No. 2, (see table of positions,) in longitude west of Greenwich 5*h.* 50*m.* 31*s.*15.	
Time-piece No. 1 fast of Chicago sidereal time for this station:	
By ten observations on *a* (Alpha) Lyræ E (at 15*h.* 32*m.*)	1*h.* 00*m.* 59*s.*98
By fifteen observations on *a* (Alpha) Bootis, W., (at 16*h.* 10*m.*)	1*h.* 00*m.* 59*s.*38
Result: Time piece No. 1 fast of Chicago sidereal time July 7, 1858, (at 12*h.* 51*m.*)	1*h.* 00*m.* 59*s.*68
By comparison: Time piece No. 2 was slow of Chicago mean solar time (at 8*h.* 48*m.* mean time) same night	4*m.* 48*s.*79

OBSERVATIONS AT MILWAUKIE.

1. *For the time.*

1858. *June* 23.—*Station:* In a vacant lot at a point 115 feet north of the parallel and 107 feet east of the meridian of the point of intersection of the middle of Milwaukie street with the middle of Mason street, equal to a difference of position of 1″.13 in latitude and 1″.44 of arc, or 0″.096 of time, in longitude.

The steeple of the Roman Catholic church on Jackson street, between Oneida and Biddle streets, is 545 feet = 5″.38 of arc in latitude north of, and 557 feet, = 7″.5 of arc, or 0″.5 of time east of the meridian of this observing station. These remarks are necessary to the reduction of position hereafter to be made.

Time-piece No. 1 fast of sidereal time for this Milwaukie station—

By ten observations on *a* (Alpha) Lyræ, east	1*h.* 00*m.* 43*s.*55
By fifteen observations on *a* (Alpha) Bootis, west	1 00 42.52
Result: Time-piece No. 1 fast of sidereal time for this Milwaukie station, (at 15*h.* 55*m.* sidereal,) June 23, 1858	1 00 43

This result, and the results obtained at Chicago on the nights of the 22d and 28th of June for the time there, and for the rates of the two time-pieces during the period elapsed between these two last mentioned dates, afford the data for determining, by means of the electric telegraph, the difference of longitude between the two places.

I would have desired a less elapsed time for the run of chronometer No. 2 at Chicago, in getting its rate for this determination, but the duties to be performed prevented my return to Chicago sooner than the 28th of June.

The whole operation, with the result, is shown as follows, viz:

Determination of the difference of longitude between Chicago and Milwaukie, by electric signals for comparisons of time, June 23, 1858.

1. MILWAUKIE SIGNALS RECORDED AT BOTH STATIONS.

Times of signals given at Milwaukie by sidereal time-piece No. 1.	Time-piece No. 1, fast of Milwaukie sidereal time.	Times of Milwaukie signals as noted at Chicago by mean solar time-piece No. 2.	Time-piece No. 2, slow of Chicago mean solar time.	Chicago correct mean solar time of Milwaukie signals.	Chicago correct sidereal time of Milwaukie signals.	Milwaukie correct sidereal time of Milwaukie signals.	Difference of longitude: Milwaukie west of Chicago.
h. m. s.	*h. m. s.*	*h. m. s.*	*m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
18 40 00	1 00 43.46	11 27 07.5	4 57.51	11 52 05.01	17 40 23 35	17 39 16.54	0 01 06.81
18 43 00	1 00 43.47	11 30 07	4 57.51	11 35 04.51	17 43 24.34	17 42 16.53	0 01 06.81

1st Mean. Electric fluid transmitted from Milwaukie to Chicago..... 0*h.* 01*m.* 06.81*s.*

2. CHICAGO SIGNALS RECORDED AT BOTH STATIONS.

Times of signals given at Chicago by mean solar time-piece No. 2.	Time-piece No. 2, slow of Chicago mean solar time.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Milwaukie by sidereal time piece No. 1.	Time-piece No. 1, fast of Milwaukie sidereal time.	Milwaukie correct sidereal time of Chicago signals.	Chicago correct sidereal time of Chicago signals.	Difference of longitude by each signal; Milwaukie west of Chicago.
h. m. s.	m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
11 48 00	4 57.50	11 52 57.50	19 00 56	1 00 43.53	18 00 12.47	18 01 19.27	0 01 06.80
12 15 00	4 57.49	12 19 57.49	19 28 00.5	1 00 43.65	18 27 16.85	18 28 23.69	0 01 06.84
12 18 00	4 57.49	12 22 57.49	19 31 01	1 00 43.67	18 30 17.33	18 31 24.19	0 01 06.86
12 23 50	4 57.48	12 28 47.48	19 36 52	1 00 43.69	18 36 08.31	18 37 15.14	0 01 06.83
12 30 00	4 57.48	12 34 57.48	19 43 03	1 00 43.72	18 42 19.28	18 43 26.15	0 01 06.87
12 35 50	4 57.47	12 40 47.47	19 48 54	1 00 43.74	18 48 10.26	18 49 17.10	0 01 06.84
12 38 40	4 57.47	12 43 37.47	19 51 44.5	1 00 43.75	18 51 00.75	18 52 07.57	0 01 06.82

	h. m. s.
2d mean —Electric fluid transmitted from Chicago to Milwaukie	0 01 06.83
1st mean—Electric fluid transmitted from Milwaukie to Chicago, as above	0 01 06.81
Result: This Milwaukie station No. 1 is west of Chicago station No. 2 by a mean of the two sets of signals	0 01 06.82

	h.	m.	s.
This Milwaukie station No. 1 is west of the meridian of the steeple of the Roman Catholic church on Jackson street, (therefore subtract)			00.5
The steeple of the Roman Catholic church on Jackson street, Milwaukie, is west of the meridian of observing station No. 2 in Chicago	0	01	06.32
Chicago observing station No. 2 is west of Greenwich, (see table of positions,) in Chicago	5	50	31.15
1st determination: Longitude of the steeple of the Roman Catholic church on Jackson street, Milwaukie, west of Greenwich, by this series of observations	5	51	37.47

It will be seen that the coincidence in the results of the seven telegraphic signals sent from Chicago to Milwaukie, in the above series, is not so close as those previously given in the case of Racine, or as those which will follow at subsequent dates, as given, from Chicago to Milwaukie.

There is an extreme difference in the results of the seven sent on the 23d of June from Chicago to Milwaukie of seven one-hundredths ($\frac{7}{100}$) of a second of time. This I attribute to the little practice which the operator at Chicago had had at that date in this species of experiments.

The results from the signals sent from Milwaukie to Chicago will be found to have been exactly coincident in two of the four cases presented, which are carried out to hundredths of a second, and in the other two cases the results for difference of longitude show an extreme difference of only the one-hundredth ($\frac{1}{100}$) part of a second of time.

This may be a matter of some interest as showing how near to perfection practice may render signals, made by pressing the telegraph key with the fingers so as to make them coincident with any desired beat of a chronometer.

On the afternoon of June 30th I received a telegram which required me to go again to Milwaukie to attend to the harbor improvement there. The journey afforded another opportunity of obtaining the difference of longitude between Chicago and Milwaukie by two new sets of observations entirely independent of that already given.

On the night of the 30th of June, before starting for Milwaukie, and on the night of July 3, after my return from thence, I made, at Chicago, the observations already given under those two dates. These, combined with the observations given as follows at Milwaukie, and the telegraphic signals passed on the night of July 1 and on the day of July 3, give the two additional determinations in question.

Observations of the time at Milwaukie.

1858, *July* 1.—The night was not very favorable for observations for the time. Passing clouds frequently obscured the stars which I desired to observe near the east and west prime vertical for that

object. The sky to the north and south was clearer, and hence more favorable to observations for the latitude, as will be seen further on. For the time, however, I could only get a single observation on Alpha Andromedæ in the east, to balance against five (5) observations on Alpha Bootis, and eight (8) on Alpha Coronæ Borealis, both in the west.

The observing station this night (July 1) was the centre or intersection of the public walks of the Court-house square, which I call Milwaukie station No. 2. From this point if we run due east two hundred and thirty-five (235) feet, and thence due north twenty-nine (29) feet, it will bring us perpendicularly under the apex of the steeple of the Roman Catholic church on Jackson street. Hence, this steple is 0″.29 north of the parallel, and 3.165 seconds of arc, or 0.21 second of time east of the meridian of this observing station.

Also, from the point of observation to a point perpendicularly under the centre of the dome of the court-house is due north 123 feet, equal to a difference of 1″.2 of latitude.

This night (July 1, 1858) Time-piece No. 1, fast of sidereal time for this Milwaukie station No. 2:

	h.	m.	s.
By 5 observations on Arcturus, (α Bootis) west	1	01	33
By 8 observations on α (Alpha) Coronæ Borealis also west	1	01	32.7
By 13 observations on two west stars	1	01	32.85
By 1 observation on α (Alpha) Andromedæ, east	1	01	33.31
Result: Time-piece No. 1, fast of sidereal time for this Milwaukie station No. 2, (at 19*h*. 53*m*.) July 1, 1858	1	01	33.08

From the above result, the error of time-piece No. 1 was reduced to the times of the following telegraphic signals which were passed before observing for the time. The weather was so cloudy that no observations on the stars could be obtained previous to the time of night at which the telegraph was at our disposal for these signals.

Determination of the difference of longitude between Chicago and Milwaukie, by electric signals for comparisons of time, July 1, 1858.

1. CHICAGO SIGNALS RECORDED AT BOTH STATIONS.

Times of signals given at Chicago by mean solar time-piece No. 2.	Time-piece No. 2, slow of Chicago mean solar time.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Milwaukie by sidereal time-piece No. 1.	Time-piece No. 1 fast of Milwaukie sidereal time.	Milwaukie correct sidereal time of Chicago signals.	Chicago correct sidereal time of Chicago signals.	Difference of longitude by each signal; Milwaukie west of Chicago.
h. m. s.	m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
10 35 20	4 52.27	10 40 12.27	18 20 20.5	1 01 32.47	17 18 48.08	17 19 54.36	0 01 06.53
10 38 20	4 52.27	10 43 12.27	18 23 21	1 01 32 48	17 21 48.52	17 22 55.05	0 01 06.53
10 41 40	4 52.27	10 46 32.27	18 26 41.5	1 01 32.49	17 25 09.01	17 26 15.60	0 01 06.59
10 44 10	4 52.27	10 49 02.27	18 29 12	1 01 32.50	17 27 39.50	17 28 46.01	0 01 06.51

1st mean—Electric fluid transmitted from Chicago to Milwaukie..... 0h 01m 06s. 54.

2. MILWAUKIE SIGNALS RECORDED AT BOTH STATIONS.

Times of signals given at Milwaukie by sidereal time-piece No. 1.	Time-piece No. 1, fast of Milwaukie sidereal time.	Times of Milwaukie signals as noted at Chicago by mean solar time-piece No. 2.	Time-piece No. 2, slow of Chicago mean solar time.	Chicago correct mean solar time of Milwaukie signals.	Chicago correct sidereal time of Milwaukie signals.	Milwaukie correct sidereal time of Milwaukie signals.	Difference of longitude; Milwaukie west of Chicago.
h. m. s.	h. m. s.	h. m. s.	m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
18 35 25	1 01 32.53	19 50 22	4 52.25	10 55 14.25	17 34 59.01	17 33 52.47	0 01 06.54
18 38 25.5	1 01 32.54	10 53 22	4 52.25	10 58 14.25	17 37 59.50	17 36 52.96	0 01 06.54
18 41 26	1 01 32.56	10 56 22	4 52.25	11 01 14.25	17 40 59.99	17 39 53.44	0 01 06.55
18 44 26.5	1 01 32.57	10 59 22	4 52.25	11 04 14.25	17 44 00.48	17 42 53.93	0 01 06.55

	h. m. s.
2d mean—Electric signals transmitted from Milwaukie to Chicago	0 01 06.545
1st mean—Electric signals transmitted from Chicago to Milwaukie, as above	0 01 06.540
Result—The centre of the Court-house Square at Milwaukie is west of the meridian of Chicago station No. 3, by a mean of the two sets of signals passed July 1, 1858	0 01 06.54
This Milwaukie station No. 2 is west of the meridian of the steeple of the Roman Catholic church on Jackson street, subtract	—0.21

	h.	m.	s.
Steeple of the Roman Catholic church, on Jackson street, Milwaukie, is west of the meridian of observing station No. 3, in Chicago, by the night's observations and signals of July 1, 1858	0	01	06.33
Longitude of the Chicago observing station No. 3, West of Greenwich, (see table of Chicago positions)	5	50	31.20
2d determination: Longitude of the steeple of the Roman Catholic church on Jackson street, Milwaukie, by the observations and signals of July 1, 1858	5	51	37.53

My duties in regard to Milwaukie harbor detained me there until the railroad train of the afternoon of the 3d of July. The night of July 2 was so cloudy that not a star could be seen, and a great part of the night it rained.

The 3d was clear, so I determined to try the result of a third series of telegraphic signals for the difference of longitude between Chicago and Milwaukie, which should rest for a time at Milwaukie on a set of equal altitudes of the sun, observed with the sextant, a. m. and p. m.

The signals were passed by the telegraphic wires between the periods of the forenoon and afternoon observations.

I could not observe in the daytime, either in the court-house yard or at the previous station, which was occupied on the 23d of June, near the intersection of Milwaukie and Mason streets, because so many vehicles and persons on foot were constantly passing near by that the artificial horizon of quicksilver was kept constantly agitated. I was obliged, therefore, to seek a more quiet position than either of the two former stations. This I found in a vacant lot at the northeast corner of Jackson and Martin streets. This I call the Milwaukie observing station No. 3. It is eight hundred and ninety (890) feet north of the parallel and thirty-eight (38) feet east of the meridian of the steeple of the Roman Catholic church on Jackson street. Hence this steeple is eight and eight-tenths seconds (8″. 8) south of the parallel, and 0″. 512 of arc, =0*s*. 034 of time west of the Milwaukie observing station No. 3.

1858, *July* 3.—*At Milwaukie observing station No.* 3.

[*Instruments.*—Sidereal time-piece (No. 1;) sextant of 7¼ inches radius, reading by aid of the vernier to 10 seconds of arc, and artificial horizon of quicksilver. Equal altitudes of the sun a. m. and p. m.]

Observed double altitudes of the sun's upper and lower limbs.		Times by sidereal time-piece (No 1.)		Elapsed sidereal time	Equation of equal altitudes in sidereal time	Time by watch of apparent noon.	Sidereal time of apparent noon.	Watch fast of sidereal time at apparent noon.
		A. M.	P. M.					
	° ′ ″	h. m. s.	h. m. s.	h. m.	s.	h. m s.	h. m. s.	h. m. s.
Upper limb	106 09 50	5 18 55.8	10 23 45.6	5 05	+2.03	7 51 42.73	6 49 42.19	1 01 40.54
Upper limb	106 58 10	5 21 17.9	10 21 23.8	5 00	2.00	7 51 22.85	----------	1 01 40.66
Lower limb	110 23 10	5 34 34.4	10 08 07.6	4 33	1.93	7 51 22.97	----------	1 01 40.78
Upper limb	115 28 10	5 46 56.8	9 55 45.9	4 09	1.89	7 51 23.24	----------	1 01 41.05
Lower limb	115 28 10	5 50 12.3	9 52 29.6	4 02	+1.85	7 51 22.80	----------	1 01 40.61

Result.—Time-piece, No. 1, fast of sidereal time for the Milwaukie observing station No. 3, at apparent noon, (say at 6*h*. 50*m*. sidereal time,) of July 3, 1858, by a mean of five pairs of equal altitudes of the sun, 1*h*. 1*m*. 40*s*.73.

After completing these observations I took the afternoon train of cars for Chicago, and arrived in time to observe there on the night of the same day, as is shown by the records already given.

The above determination of the time at Milwaukie, combined with the results of the observations given at Chicago for the 30th of June and the 3d of July, and applied to the telegraphic signals which were passed on the afternoon of the last mentioned day, between Chicago and Milwaukie, gives us a third determination of the difference of longitude between these two places.

It is as follows, viz:

Determination of the difference of longitude between Chicago and Milwaukie by electric signals for comparisons of time, July 3, 1858.

1. CHICAGO SIGNALS RECORDED AT BOTH STATIONS.

Times of signals given at Chicago by mean solar time-piece No. 2.	Time-piece No 2 slow of Chicago mean solar time.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Milwaukie by sidereal time-piece No. 1.	Time-piece No. 1 fast of Milwaukie sidereal time.	Milwaukie correct sidereal time of Chicago signals.	Chicago correct sidereal time of Chicago signals.	Difference of longitude by each signal; Milwaukie west of Chicago.
h. m. s.	*m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
1 11 00	4 51.06	1 15 51.06	9 02 28.5	1 01 41.01	8 00 47.49	8 01 53.76	0 01 06.27
1 14 30	4 51.06	1 19 21.06	9 05 59.0	1 01 41.02	8 04 17.98	8 05 24.33	0 01 06.35
1 17 10	4 51.06	1 22 01.06	9 08 39.5	1 01 41.03	8 06 58.47	8 08 04.77	0 01 06.30
1 20 00	4 51.06	1 24 51.06	9 11 30.0	1 01 41.05	8 09 48.95	8 10 55.23	0 01 06.28

1st mean—Electric signals sent from Chicago to Milwaukie..... 0 01 06.30

2. MILWAUKIE SIGNALS RECORDED AT BOTH STATIONS.

Times of signals given at Milwaukie by sidereal time-piece No. 1.	Time-piece No. 1 fast of Milwaukie sidereal time.	Times of Milwaukie signals as noted at Chicago by mean solar time-piece No. 2.	Time-piece No. 2 slow of Chicago mean solar time.	Chicago correct mean solar time of Milwaukie signals.	Chicago correct sidereal time of Milwaukie signals.	Milwaukie correct sidereal time of Milwaukie signals.	Difference of longitude; Milwaukie west of Chicago.
h. m. s.	h. m. s.	h. m. s.	m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
9 17 35.0	1 01 41.07	1 26 04.	4 51.05	1 30 55.05	8 17 00.22	8 15 53.93	0 01 06.29
9 20 35.5	1 01 41.08	1 29 04.	4 51.05	1 33 55.05	8 20 00.71	8 18 54.42	0 01 06.29
9 23 36.0	1 01 41.09	1 32 04.	4 51.05	1 36 55.05	8 23 01.20	8 21 54.91	0 01 06.29
9 26 36.5	1 01 41.10	1 35 04.	4 51.05	1 39 55.05	8 26 01.69	8 24 55.40	0 01 06.29

	h. m. s
2d mean—Electric signals sent from Milwaukie to Chicago	0 01 06.29
1st mean—Electric signals sent from Chicago to Milwaukie, given above	0 01 06.30
Result.—Milwaukie observing station No. 3 is west of the meridian of the Chicago station No. 3, by a mean of the two sets of signals passed in the afternoon of July 3, 1858	0 01 06.3

	h.	m.	s.
Brought forward	0	01	06.3
The steeple of the Roman Catholic church on Jackson street is west of the Milwaukie observing station No. 3			+0.03
Hence the steeple of this Roman Catholic church at Milwaukie is west of the meridian of the Chicago observing station No. 3, by this third determination made July 3, 1858	0	01	06.33
Longitude of the Chicago observing station No. 3, west of the meridian of Greenwich	5	50	31.20
3*d determination:* Longitude of the steeple of the Roman Catholic church on Jackson street, Milwaukie, west of the meridian of Greenwich, by this third determination made July 3, 1858	5	51	37.53

Late in the afternoon of the 5th of July I was again summoned to Milwaukie to give some special directions there in regard to the operations of the United States steam dredge, and the repairs required to keep her in good working order. I consequently left Chicago for that place on the morning of July 6, and returned to Chicago by the afternoon rail-train of July 7. On the night before I started on this journey I made the observations for the time at Chicago, reported in a previous part of this paper under the date of July 5. After my return I made, on the night of July 7, those which are reported under that date. These two results give the rates of both time-pieces during the interval of time, which was forty-four (44) mean solar hours, and also the means of reducing the time at Chicago to the period of the telegraphic signals which were passed between that place and Milwaukie on the night of the 6th of July.

After the duties of the day were over at Milwaukie, I made, at night, the following observations for the time at the same station which was occupied for observing the equal altitudes of the sun on the 3d of July. It is called Milwaukie observing station No. 3.

Two sets of time observations were made at this station on the night of July 6, one set before exchanging the telegraphic signals with Chicago, and another set after the said signals. The mean of the two results was adopted for the mean period of the two, which corresponds nearly (within half an hour) with the mean period of the signals, and thus leaves but half an hour's run of time-piece No. 1, between the moment of getting its error from observation and the mean period of the signals.

Observations for the time at Milwaukie, made in the night of July 6, 1858, *at Milwaukie station No.* 3.

1*st set; before the telegraphic signals:* Time-piece No. 1, fast of sidereal time for this station:

	h. m. s.
By 12 observations on *a* (Alpha) Lyræ, E., (at 15*h.* 39*m.* sidereal)	1 02 01.19
By 13 observations on *a* (Alpha) Bootis, (Arcturus,) W., (at 16*h.* 04*m.* sidereal)	1 02 00.15
1*st result.—Before telegraphic signals:* Time-piece No. 1, fast of sidereal time for Milwaukie station No. 3, at 15*h.* 52*m.* sidereal, of July 6, 1858	1 02 00.67

2*d set; after the telegraphic signals:* Time-piece No. 1 fast of sidereal time for this station:

	h. m. s.
By 5 observations on *a* (Alpha) Coronæ Borealis, W., (at 20*h.* 08*m.*)	1 02 01.83
By 5 observations on *a* (Alpha) Andromedæ, E., (at 20*h.* 22*m.*)	1 02 00.94
2*d result.—After telegraphic signals:* Time-piece No. 1 fast of sidereal time for Milwaukie station No. 3, at 20*h.* 15*m.*, sidereal of July 6, 1858	1 02 01.38
Do. do. at 15*h.* 52*m.* sidereal, before the signals, as above	1 02 00.67
Result adopted.—Time-piece No. 1 fast of sidereal time for Milwaukie observing station No. 3, at 18*h.* 03*m.*, sidereal, of July 6, 1858	1 02 01.00

The above result, combined with the results for the time at Chicago, as derived from the observations of July 5 and July 7, already given, and the telegraphic signals which were exchanged between the two places on the night of July 6, give us a fourth (4th) determination of the difference of longitude between Chicago and Milwaukie entirely independent of the other three, as follows, viz:

Determination of the difference of longitude between Chicago and Milwaukie by electric signals for comparisons of time, July 6, 1858.

1. CHICAGO SIGNALS RECORDED AT BOTH STATIONS.

Times of signals given at Chicago by mean solar time-piece No. 2.	Time-piece No. 2, slow of Chicago mean solar time.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Milwaukie by sidereal time-piece No. 1.	Time-piece No. 1 fast of Milwaukie sidereal time.	Milwaukie correct sidereal time of Chicago signals.	Chicago correct sidereal time of Chicago signals.	Difference of longitude by each signal — Milwaukie west of Chicago.
h. m. s.	*m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 00 20	4 49.1	10 05 09.1	18 05 23.0	1 02 00.78	17 03 22.22	17 04 28.42	0 01 06.20
10 03 20	4 49.1	10 08 09.1	18 08 23.5	1 02 00.79	17 06 22.71	17 07 28.91	0 01 06.20
10 06 20	4 49.1	10 11 09.1	18 11 24.0	1 02 00.80	17 09 13.20	17 10 29.41	0 01 06.21
10 09 20	4 49.1	10 14 09.1	18 14 24.5	1 02 00.81	17 12 23.69	17 13 29.90	0 01 06.21
10 12 10	4.49.1	10 16 59.1	18 17 15.0	1 02 00.82	17 15 14.18	17 16 20.37	0 01 06.19

1st mean—Electric fluid transmitted from Chicago to Milwaukie, 0*h.* 01*m.* 06*s.* 202.

Times of signals given at Milwaukie by sidereal time-piece No. 1.	Time-piece No. 1, fast of Milwaukie sidereal time.	Times of Milwaukie signals, as noted at Chicago by mean solar time-piece No. 2.	Time-piece No. 2, slow of Chicago mean solar time.	Chicago correct mean solar time of Milwaukie signals.	Chicago correct sidereal time of Milwaukie signals.	Milwaukie correct sidereal time of Milwaukie signals.	Difference of longitude; Milwaukie, west of Chicago.
h. m. s.	h. m s.	h. m. s.	m. s.	h. m. s.	h m. s.	h. m. s.	h. m. s.
18 23 15	1 02 00.85	10 18 09	4 49.09	10 22 58.09	17 22 20.34	17 21 14.15	0 01 06.19
18 26 15	1 02 00.86	10 21 08.5	4 49.09	10 25 57.59	17 25 20.33	17 24 14.14	0 01 06.19
18 29 16	1 02 00.87	10 24 09	4 49.09	10 28 58.09	17 28 21.32	17 27 15.13	0 01 06.19
18 32 16.5	1 02 00.88	10 27 09	4 49.09	10 31 58.09	17 31 21.82	17 30 15.62.	0 01 06.20
18 35 17	1 02 00.89	10 30 09	4 49.09	10 34 58.09	17 34 22.31	17 33 16.11	0 01 06.20

	h. m. s.
2d Mean.—Electric fluid transmitted from Milwaukie to Chicago	0 01 06.194
1st Mean.—Electric fluid transmitted from Chicago to Milwaukie, as before	0 01 06.202
Result.—Milwaukie station No. 3 is west of the meridian of the Chicago observing station No. 3, by a mean of the two sets of telegraphic signals passed on the night of July 6, 1858	0 01 06.2

To reduce to the steeple of the Roman Catholic church on Jackson street, as before	+0.03
Hence, the steeple of this church at Milwaukie is west of the meridian of the Chicago observing station No. 3, by this fourth determination, of July 6, 1858	0 01 06.23
Longitude of Chicago observing station No. 3, west of the meridian of Greenwich	5 50 31.2
4th determination.—Longitude of the steeple of the Roman Catholic church on Jackson street, Milwaukie, west of the meridian of Greenwich	5 51 37.43

Recapitulation of the four determinations of the longitude of Milwaukie, Wisconsin.

They are all referred to the steeple of the Roman Catholic church on Jackson street.

	h. *m.* *s.*
1. Determination of June 23, 1858	5 51 37.47
2. Determination of July 1, 1858	5 51 37.53
3. Determination of July 3, 1858	5 51 37.53
4. Determination of July 6, 1858	5 51 37.43
Mean.—Longitude of the steeple of the Roman Catholic church on Jackson street, Milwaukie, west of the meridian of Greenwich	5 51 37.5
Longitude in arc	87° 54′ 22.″5

Rates of the time-pieces, derived from the observations made at Chicago.

1. *The rate of the sidereal time-piece No* 1.

From—	To—	Elapsed sidereal interval.	Rate per 24 sidereal hours.
		Days and decimals.	Gaining.
			s.
June 22, 1858	June 28, 1858	6.000	+ 6.14
June 28, 1858	June 30, 1858	2.162	+ 6.15
June 30, 1858	July 3, 1858	2.870	+ 5.66
July 3, 1858	July 5, 1858	2.127	+ 6.07
July 5, 1858	July 7, 1858	1.837	+ 5.27
Sept. 5, 1858	Sept. 7, 1858	2.079	+ 6.00

2. *Rate of the mean solar time-piece No. 2.*

From—	To—	Elapsed mean solar interval. Days and decimals.	Rate per 24 mean solar hours. + Gaining. — Losing.
			s.
June 22, 1858	June 28, 1858	5.983	+ 0.76
June 28, 1858	June 30, 1858	2.155	+ 0.30
June 30, 1858	July 3, 1858	2.860	+ 0.90
July 3, 1858	July 5, 1858	2.120	+ 0.54
July 5, 1858	July 7, 1858	1.833	+ 0.32
Sept. 5, 1858	Sept. 7, 1858	2.064	+ 0.07

The latitude of Milwaukie.

This was observed on the night of July 1, 1858, at Milwaukie station No. 2, or the centre of the court-house square; and also on the night of July 6, 1858, at Milwaukie station No. 3, already described. Both nights' observations are reduced to the steeple of the Roman Catholic church on Jackson street.

Observations.

July 1, 1858.—At Milwaukie station No. 2, in the centre of the court-house square.

Latitude of station.

By 17 circum-meridian altitudes of α (Alpha) Aquilæ, S.	43° 02′ 35″.5
By 12 altitudes of Polaris, (α Ursæ Minoris,) N	43° 02′ 32″.3
Result.—Latitude of station	43° 02′ 33″.9
Reduction to steeple of Roman Catholic church on Jackson street	+ 0″.29
Latitude of the steeple, deduced from this night's observations	43° 02′ 34″.19

July 6, 1858.—At Milwaukie station No. 3, already described.

Latitude of station.

By 17 altitudes of Polaris, (α Ursæ Minoris,) N	43° 02′ 39″.12
By 26 circum-meridian altitudes of α (Alpha) Aquilæ, S.	43° 02′ 45″.77
Result.—Latitude of station	43° 02′ 42″.45
Reduction to the steeple of the Roman Catholic church on Jackson street	— 8″.8

Latitude of this steeple by the observations of July 6, 1858 ..... 43° 02′ 33″.65
Latitude by the observations of July 1, 1858, above given ..... 43° 02′ 34″.19

Final result.—Latitude of the steeple of the Roman Catholic church on Jackson street, Milwaukie ..... 43° 02′ 33″.9
Longitude of the steeple of the Roman Catholic church on Jackson street, Milwaukie, as above given, W. of the meridian of Greenwich .... 5*h.* 51*m.* 37.5*s.* = 87° 54′ 22″.5

From the two last expressed data, and the measurements made along the streets, we present the following table of latitudes and longitudes of positions in Milwaukie, viz:

Positions in Milwaukie.	Latitude north.	Longitude west of Greenwich.	
		In arc.	In time.
	° ′ ″	° ′ ″	h. m. s
1. The dome of the court-house	43 02 34.8	87 54 25.66	5 51 37.71
2. The centre of the court-house public square.	43 02 33.6	87 54 25.66	5 51 37.71
3. The steeple of the Roman Catholic church on Jackson street	43 02 33.9	87 54 22.5	5 51 37.5
4. The intersection of the middle of Milwaukie street with the middle of Mason street.	43 02 27.4	87 54 31.4	5 51 38.1
5. The light-house	----------	----------	----------
6. The beacon light at the end of the north harbor pier	----------	----------	----------

It has been shown above that the positions of the court-houses of Racine and Milwaukie are as follows, viz:

	Latitude north.	Longitude west of Greenwich.
	° ′ ″	° ′ ″
Dome of the Racine court-house	42 43 44.6	87 47 04
Dome of the Milwaukie court-house	43 02 34.8	87 54 25.66
Difference.—Milwaukie + (plus) both in latitude and longitude	18 50.2	7 21.66

Hence, the distance from the court-house of Racine to the court-house of Milwaukie, measured in the direct or shortest line on the spheroid, is 22.546 miles on an azimuth of N. 15° 59′ 19″ W.

The azimuth back from Milwaukie to Racine is S. 16° 04′ 19″.5 E.

Assuming this determination as a base, and allowing for the contour of the coast-line, we make the navigable distance from Racine harbor to Milwaukie harbor twenty-five and two-thirds (25⅔) miles.

B 1.—MILWAUKIE HARBOR, WISCONSIN.

Statement of the number of cubic yards of earth excavated and removed by the United States steam dredge and scows for improving the new harbor at the north cut at Milwaukie, between the 1st of October, 1857, and the 27th of July, 1858.

[The whole of this excavation was done in the new or north cut at the west end of the channel formed by the new piers, in order to open a communication with Milwaukie river.]

Date.		No. cubic yards	Date.		No. cubic yards.
	1857.			1858.	
October	1	600	May	25	260
	5	440		26	380
	6	520		27	260
	7	600		28	100
	8	580		29	300
	9	520	June	1	480
	10	520		2	520
	12	500		4	440
	13	600		5	420
	14	520		7	480
	15	280		8	520
	17	340		9	540
	18	360		11	480
	20	400		12	580
	21	420		14	700
	22	560		15	660
	23	600		16	620
	24	480		17	660
	26	520		18	460
	27	500		19	760
	28	560		21	480
	29	520		22	700
	30	560		23	700
	31	600		24	360
November	2	600		25	480
	4	520		26	520
	5	480		28	580
	6	560		29	420
	9	400		30	400
	10	500	July	1	420
	11	500		2	480
	12	560		3	500
	13	400		6	320
	14	520		7	380
	16	600		8	360
	17	560		9	460
	18	600		10	500
	1858.			12	640
May	8	400		13	680
	12	500		15	640
	13	620		16	620
	14	620		17	620
	15	580		19	540
	18	400		20	640
	19	460		21	540
	20	520		22	580
	21	400		24	440
	22	580		26	680
	24	400		27	340
Total number of cubic yards excavated and removed by the United States steam dredge and her scows for the improvement of Milwaukie new harbor, between October 1, 1857, and July 27, 1858					49,120

RECAPITULATION,

Showing the quantity of earth excavated and removed by the United States steam dredge and scows for the improvement of the new harbor at Milwaukie during the whole of the working seasons of 1857 *and* 1858.

	Cubic yards.
1. Quantity dredged and removed from the channel between the new piers, from June 26 to September 22, 1857, as per statement B 2, at page 70 of Senate (executive) document No. 42, of the 35th Congress, 1st session.	14,260
2. Quantity dredged and removed from the Middle Ground, in Milwaukie river, west of the new or north cut, from July 16 to September 30, 1857, as per same statement, continued at page 71 of the same Senate document, No. 42	18,144
3. Quantity dredged and removed from the new or north cut, to open a free communication between the channel formed by the new piers and Milwaukie river, from October 1 to November 18, 1857, and from May 8 to July 27, 1858, now first reported	49,120
Aggregate quantity dredged and removed by the United States steam dredge and scows in 1857 and 1858, for the improvement of the new harbor at Milwaukie, Wisconsin.	81,524

J. D. GRAHAM,
Major U. S. T. Engineer Corps, Bvt. Lieut. Colonel,
Superintending Engineer of Lake Harbor Works.

OFFICE GENERAL SUPERINTENDENCE LAKE HARBOR WORKS,
Chicago, November 15, 1858.

B 2.

Estimate of the cost of repairing the breach in the land strip separating the lower part of Milwaukie river from Lake Michigan.

This will require eight cribs, each 32 feet long, 10 feet wide, and of an average height of 4 feet from bottom to the water surface, or 9 feet high from bottom to top. It is proposed to build them after the specifications given in table T 1, printed at pages 12 to 15 of Senate (executive) document No. 16, of the 34th Congress, 3d session, making due allowance for the diminished width of 10 feet, instead of 20 feet, which is provided for in table T 1.

Estimate for one crib.

For 1,020 lineal feet of pine timber, hewn or sawed, one foot square, at 16 cents per lineal foot	$163 20
For 741 feet, board measure, of oak plank, 3 inches thick, for flooring, at $18 per thousand	13 34
For 917 pounds of wrought iron, one inch square, for bolts, at 4 cents per pound	36 68
For 68 pounds of wrought iron spikes, $\frac{3}{8}$ by $\frac{3}{8}$ square, at $7\frac{1}{2}$ cents	7 30
For 13 cords of ballast stone, at $9 per cord	117 00
For carpentry, labor, and superintendence	150 00
Sum	487 52
Add ten per cent. for contingencies	48 75
Estimated cost of one crib	536 27
Then, eight cribs, at $536 27, give for the repair of this breach	4,290 16

J. D. GRAHAM,
Major Top'l Eng'rs, Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE LAKE HARBOR WORKS,
Chicago, November 15, 1858.

6. SHEBOYGAN HARBOR, WISCONSIN.

There have been no funds at my disposal for this harbor since August, 1856. Only a very small balance was in hand after July of that year. It was expended in making a survey of the harbor, and the map projected from it, marked G No. 45, is in the Topographical Bureau, and a copy is in the archives of the United States Senate.

Having no means to make any more recent examinations of this harbor, I must refer to that map and the estimates heretofore submitted in detail for its completion, amounting to $36,614 55.

For details of items, and for an account of the commerce of this harbor, I beg leave to refer to my estimates and statements, to be found printed at pp. 252 to 288, and at pp. 342 and 343, of Senate Ex. Doc. No. 16, of the 34th Congress, 3d session.

I offer the estimates therein contained as my estimates for this year, and I would recommend that the whole be granted in one appropriation.

7. MANITOWOC HARBOR, WISCONSIN.

The appropriation of 1852 for this work—the only one ever made—was exhausted, as heretofore reported, in the working season of 1854. No work has, therefore, been done at this harbor since that time. A survey of the harbor was made under my direction in August, 1856.

The map projected from it, marked G No. 46, is in the Topographical Bureau, and a copy is in the archives of the United States Senate.

In regard to this harbor, I must refer to the statements and estimates contained in my previous reports, to be found printed at pp. 288 to 300, and 343 to 344, of the last mentioned Senate document.

I renew here the estimates therein contained, amounting to $62,780 94.

I recommend that this sum be granted in two annual appropriations, as follows, viz:

The first year	$40,000 00
The second year	22,780 94
Total, as before	62,780 94

8. MICHIGAN CITY BREAKWATER, INDIANA.

No work has been carried on here since 1855, for the reason that the appropriation of 1852 was expended, as heretofore reported, in a vain attempt to commence the breakwater, in accordance with a plan entirely too contracted for a work of this kind on Lake Michigan, which should be of a capacity and durability to afford protection as a harbor of refuge or safe anchorage for the shipping of the lakes generally which are in trade with the ports of Lake Michigan. It is in this point that any breakwater on this lake should be viewed commercially. As a place of refuge from the lake gales, such a work would be indispensable in time of war for our armed ships.

As it seems unnecessary for me to reiterate here all that I have heretofore presented for consideration on this subject. I beg to refer to my previous reports, printed at pp. 344 to 374 of Senate Ex. Doc No. 16, of the 34th Congress, 3d session; also at pp. 76 (last paragraph) to 77, of Senate Ex. Doc. No. 42, of the 35th Congress, 1st session.

I recommend here the estimates therein presented for this work.

As there was no money to carry on this work, I was obliged, in June last, under the regulation of the War Department, to turn over a quantity of timber and tools appertaining to it to another public work under my direction, according to a valuation fixed by a board of survey. The timber was becoming injured by the effect of time, and would not bear to be kept another season.

The balance remaining on hand of the proceeds of this sale on the 30th of September, 1858, was eighty-two dollars and seventy-six and one-fourth cents, say $82 76¼.

This is in course of expenditure in making a new survey here, which is indispensable to a revised plan for this work.

9. NEW BUFFALO HARBOR, MICHIGAN.

No work has been done at this harbor for the want of means, as heretofore reported. A minute survey was made of this harbor in

September, 1857. The resulting map, marked G No. 54, was sent in duplicate to the Topographical Bureau. A copy is in the archives of the United States Senate.

For full information respecting the character of this place, and its susceptibility of improvement, so as to make a good harbor, I beg leave to refer to my last annual report printed, from p. 74 to p. 82 of Senate Ex. Doc. No. 42, of the 35th Congress, 1st session.

I herewith present the estimates, reiterated from last year. They are as follows, viz:

Estimate C 1.

For a harbor to suit the local trade	$98,113 47

Estimate C 2.

For a harbor to serve both the purposes of a harbor of refuge for the lake commerce and for the local trade, $176,607 79.

I would recommend that this last mentioned sum be granted, as adopting the most useful of the two plans of improvement, and that it be granted in three annual appropriations, as follows, viz:

The first year	$60,000 00
The second year	53,803 90
The third year	53,803 89
Total, as per estimate C 2	167,607 79

C 1.

NEW BUFFALO HARBOR, MICHIGAN.

Estimate of the cost of constructing a harbor at New Buffalo, Michigan, of a capacity to suit the present local trade of the place and the smaller class of vessels navigating Lake Michigan.

1. THE HARBOR PIERS.

These will be required to project 600 feet from the shore into the lake; each pier will, therefore, require 20 cribs, or 40 cribs for both piers, each 30 feet long, 25 feet wide, and 15 feet high from bottom to top, and 10 feet high from bottom to the surface of the water, to be constructed according to the drawings in sheet G No. 21, in the Topographical Bureau, and the tables marked T 3, at pages 18 to 21, of Senate Ex. Doc. No. 16, of the 34th Congress, 2d session.

The cost of each crib will be as follows:

For 1,813½ lineal feet of pine timber, hewn or sawed, 1 foot square, at 18 cents per lineal foot	$326 43
For 927½ lineal feet of white oak timber, hewn or sawed, 1 foot square, at 22 cents per lineal foot	204 05

For 1,728 feet, board measure, of white oak plank, in pieces 24 feet long by eight inches wide, and three inches thick, at $20 per M	$34 56
For 4,196⅓ pounds of wrought iron, round in form, and 1½ inch in diameter, for bolts, at 4 cents per pound	167 85
For 126.8 pounds of wrought iron spikes, ⅜ by ⅜ of an inch square and 6 inches long, headed and pointed, at 7½ cents per pound	9 51
For 55 cords of hard boulder stone, for crib ballast, at $10 per cord	550 00
Cost of material for one crib	1,292 40
For carpentry, labor, hauling, and superintendence	350 00
Sum	1,642 40
Add 10 per cent. for contingencies	164 24
Estimated cost of each crib	1,806 64
Then, 40 cribs, at $1,806 64 each, will cost for the two piers	72,265 60

2. FOR THE DREDGING TO OBTAIN TEN FEET DEPTH OF WATER BETWEEN THE PIERS.

This will require the excavation and removal of the following quantity of sand, viz:

38,666 cubic yards, at 14 cents per cubic yard	$5,413 24

3. FOR THE THOROUGH CUT BETWEEN LAKE MICHIGAN AND POTTAWATOMIE LAKE.—(*See map G No.* 54.)

This cut will be 460 feet long by 302 feet wide at the water surface. The greatest elevation of the cut is 12 feet above the water level. The average elevation is, however, only 4.8 feet. It is proposed to give the sides of this cut a slope of 2 base to 1 perpendicular. At this slope the soil will stand if sown with grass seed, and thus covered with grass.

The number of cubic yards to be removed from this portion of the cut will be as follows, viz:

25,491 cubic yards of sand, at 15 cents per cubic yard	$3,823 65
Then, for a cut with perpendicular sides, 302 feet wide and 10 feet deep, and 460 feet long, will require as follows, viz: 51,451 cubic yards of sand to be removed by dredging, at 6 cents per cubic yard, as it will be purchased for filling on the fronts of water lots at a price which will leave 6 cents per cubic yard as the net cost of dredging	3,087 06
Estimated cost of the excavation for the thorough cut, to a depth of 10 feet below the level of the lake surface	6,910 71

4. FOR PROTECTING THE SIDES OF THE THOROUGH CUT FROM ABRASION.

This will require an oak pile, 1 foot square and 27 feet long, to be driven at every 10 feet apart, to which oak caps and stringers are to be bolted, and then the spaces filled by driving sheath piles 27 feet long by 8 to 10 inches wide and 4 inches thick, to be bolted to the caps and stringers, these piles to be driven 10 feet into the soil.

Then, for both sides of the cut there will be required as follows, viz:

For 92 white oak piles, each 27 feet long and 1 foot square = 2,484 cubic feet of white oak, at 25 cents per cubic foot	$621 00
For driving ninety-two white oak piles, at $2 50 each	230 00
For 920 lineal feet of white oak caps, one foot square, at twenty-two cents per lineal foot	202 40
For 920 lineal feet of white oak stringers, to be placed two feet above the water line, at twenty-two cents	202 40
For 368 wrought iron bolts, each twenty inches long, of one and a half inch diameter, round wrought iron = 613 lineal feet, weighing 5.972 pounds per foot = 3,661 pounds, at four cents per pound	146 44
For 89,424 feet, board measure, of white oak sheath piling, in pieces twenty-seven feet long and four inches thick, at twenty-five dollars per M	2,235 60
For driving 828 sheath piles, at one dollar each	828 00
For 3,312 wrought iron spikes for fastening the sheath piles to the caps and stringers, each nine inches long and three-fourths by three-fourths of an inch square, weighing 1.493 pounds per lineal foot, or 1.12 pounds per spike = 3,709 pounds, at six cents per pound	222 54
4. Estimated cost of protecting the sides of the channel through the thorough cut	4,688 38

5. FOR DREDGING A BASIN IN POTTAWATOMIE LAKE.

For a harbor on the scale above described, a basin, 1,420 feet long by 700 feet wide, limited by the dotted lines AB, BC, CD, DA, drawn upon map G No. 54, if dredged to a depth of twelve feet below the present lake surface, would suffice. The area of such a basin would be 110,444 square yards, or 22.8 acres.

The average depth of water now existing here is four feet, but the lake is now about three and a half feet higher than its low water stage. The depth of excavation in the soil would then be eight feet, and the quantity of soil to be removed 294,518 cubic yards.

It is stated in the report of Mr. Berrien, before alluded to, that this soil is so soft that it can be removed by a dredging machine at a cost of three (3) cents per cubic yard.

Our own survey, made in September, 1857, corroborates this statement as correct.

5. Then, 294,518 cubic yards, at three cents per yard..	$8,835 54

The owners of lots fronting on this basin would erect lines of sheath piling on its borders at their own expense, within which they would be glad to receive the excavated stuff for filling up lots to required grades, and thus it would be secured against being carried back into the basin.

Recapitulation of items in estimate C 1.

1. For two parallel piers, 600 feet long, each, and 300 feet apart	$72,265 60
2. For dredging between these piers to obtain a depth of ten feet of water	5,413 24
3. For excavation to form the thorough cut	6,910 71
4. For piling to protect the sides of the thorough cut from abrasion	4,688 38
5. For dredging a basin in Pottawatomie lake, 1,420 feet long by 700 feet wide, to produce twelve feet depth of water	8,835 54
Amount of estimate C 1	98,113 47

J. D. GRAHAM,
Major Top'l Eng'r Corps, Bt. Lieut. Col., Supt'g Eng'r.

OFFICE GEN. SUP. OF LAKE HARBOR WORKS,
Chicago, November 15, 1858.

C 2.

Estimate of the cost of constructing a harbor at New Buffalo, Michigan, suitable for the accommodation as a harbor of refuge of the largest class of mercantile vessels navigating Lake Michigan.

For such a harbor the piers should reach to a depth of sixteen (16) feet of water in Lake Michigan, and the west pier would, in that case, be eight hundred and ten (810) feet long, and the east pier would be seven hundred and fifty (750) feet long, and their interior faces would be three hundred (300) feet apart. It is proposed to construct these piers in accordance with the drawings in sheet G No. 21, and the specifications in table T 3, contained in my report No. 116, of December 31, 1856, to be found at pages 18 to 21 of Senate Ex. Doc. No. 16, of the 34th Congress, 3d session; the depth of water between the piers to be thirteen (13) feet.

The thorough cut, to communicate with Pottawatómie lake, will be the same as in estimate C 1, except that the depth of its water prism should be thirteen (13) feet, instead of ten (10) feet.

The interior basin in Pottawatomie lake should be 2,450 feet long

by 700 feet wide, corresponding to the figure E F G H, drawn in dotted lines on the map G No. 54, and it should be thirteen feet deep.

The estimate of these several items will then be as follows, viz:

1. THE HARBOR PIERS.

These will require 27 cribs for the west pier and 25 for the east pier, or 52 cribs for both piers, each 30 feet long, 25 feet wide, and of an average depth from top to bottom of 18 feet, or 13 feet from the water line to the soil at bottom.

The cost of one crib will be as follows, viz:

For 3,236 lineal feet of white oak timber, hewn one foot square, at 22 cents per lineal foot	$711 92
For 1,728 feet, board measure, of white oak plank, three inches thick, for flooring, at $20 per thousand	34 56
For 5,074 pounds of round wrought iron, for bolts, 1½ inch in diameter, at 4 cents per pound	202 96
For 127 pounds of wrought iron spikes, ⅜ by ⅜ of an inch square, pointed and headed, at 7½ cents per pound	9 52
For 67⅕ cords of hard boulder stone, for crib ballast, at $10 per cord	672 00
Estimated cost of materials for one crib	1,630 96
For carpentry, labor, superintendence, &c	500 00
Add ten per cent. on the above for contingencies	213 09
Estimated cost of one crib	2,344 05
(1.) Then, 52 cribs, at $2,344 05 each, equals for the cost of the two piers	$121,890 50

2. FOR THE DREDGING TO OBTAIN THIRTEEN FEET DEPTH OF WATER BETWEEN THE PIERS.

This will require the excavation and removal of the following quantity of sand, viz:

(2.) 60,141 cubic yards, at 14 cents per cubic yard $8,419 74

3. FOR THE THOROUGH CUT BETWEEN LAKE MICHIGAN AND POTTAWATOMIE LAKE.—*(See map G No. 54.)*

The first item under this head will be the same as it is under the third head in estimate C 1, namely:

Cutting to the depth necessary to reach the level of the water surface,

25,491 cubic yards of sand, at 15 cents per cubic yard	$3,823 65
Then, for a channel with perpendicular sides, 302 feet wide, 460 feet long, and 13 feet deep, there will be required to be excavated 66,887 cubic yards, at six cents per cubic yard	4,013 22
(3.) Estimated cost of a thorough cut, with a water prism 13 feet deep	7,836 87

4. FOR PROTECTING THE SIDES OF THE CHANNEL IN THE THOROUGH CUT FROM ABRASION.

This will be the same as the item under the fourth head of the estimate marked C 1, viz	$4,688 38

5. FOR DREDGING A BASIN IN POTTAWATOMIE LAKE.

This basin should be of sufficient capacity to accommodate, as a harbor of refuge, the general mercantile marine of Lake Michigan, and also our national armed ships in time of war. The depth for the mercantile marine need not be greater than thirteen feet, and our estimate is therefore based on that depth. It may easily, and in a few weeks, be increased to twenty feet of depth to accommodate ships of war. The depth between the piers would, in such an event, have to be similarly increased by dredging. The dredging would be done by the steam dredge belonging to Lake Michigan.

Then, an excavation 2,450 feet long by 700 feet wide, and 13 feet deep, will require the removal by the dredging machine of the following quantity of this soft mud, viz: 825,740 cubic yards, at three cents per cubic yard, $24,772 20.

Recapitulation of items in estimate C 2.

1. For two parallel piers, the west being 810 feet long and the east 750 feet long, each 25 feet wide and 300 feet apart	$121,890 60
2. For dredging to produce a depth of 13 feet of water between these piers	8,419 74
3. For the excavation to form the thorough cut, with a water prism 13 feet deep	7,836 87
4. For protecting, by close piling, the sides of the channel in the thorough cut against abrasion	4,688 38
5. For dredging a basin in Pottawatomie lake, 2,450 feet long by 700 feet wide, and 13 feet deep	24,772 20
Amount of estimate C 2	167,607 79

J. D. GRAHAM,
Maj. Top. Eng. Corps, Bvt. Lieut. Col., Sup'g Eng'r.

OFFICE GENERAL SUPERINTENDENCE LAKE HARBOR WORKS,
Chicago, November 15, 1858.

10. ST. JOSEPH'S HARBOR, MICHIGAN.

This harbor is in a much worse condition now than ever before reported. From the breaking in of the lake sea through the rotten piers, fully described in my previous reports, the channel is much diminished in depth.

I ask a reference to my reports upon this very important lake harbor, printed in Senate (Ex.) Doc. No. 16, of the 34th Congress, 3d session, from p. 379 to p. 385, and in Senate (Ex.) Doc. No. 42, at pp. 82 to 84.

I beg leave to renew the estimate for this work, given at page 83 of the last mentioned document, amounting to the sum of $97,633 91.

I recommend now that the whole of this sum be granted in one appropriation, as I consider this measure necessary to save this harbor from ruin.

I would refer to the maps, G No. 47 and G No. 55, now in the Topographical Bureau and in the archives of the Senate, for a full understanding of the importance of this harbor, and of its present dilapidated condition.

11. BLACK LAKE HARBOR, MICHIGAN.

In regard to the importance of this improvement, I beg leave to refer to my previous reports, printed at pp. 386 and 387 of Senate (Ex.) Doc. No. 16, of the 34th Congress, 3d session, and at pp. 84 to 89 of Senate (Ex.) Doc. No. 42, of the 35th Congress, 1st session.

I renew the estimates contained in full detail at pp. 87 to 89 of the last mentioned document. They amount to $128,343 02.

I recommend that the amount be granted in three equal annual appropriations, each of $42,781.

In regard to this harbor, I will refer to map G No. 48, now in the Topographical Bureau and in the archives of the United States Senate.

12. GRAND RIVER HARBOR, MICHIGAN.

This was always regarded as one of the most important harbors on the eastern coast of Lake Michigan, and from the connexion by railroad with Detroit, lately completed, and the further connexion with Milwaukie by steam vessels, it has become one of the most important on Lake Michigan. These connexions were completed in October of the present year. They have created a link of vast trade between the old northern and the new western States.

For a full exposition of the importance of this harbor, and of its great susceptibility of improvement, I beg leave to refer to map G No. 49, now in the Topographical Bureau and in the archives of the United States Senate, and also to my annual report for 1857, printed at pp. 89 to 95 of Senate (Ex.) Doc. No. 42 of the 35th Congress, 1st session.

The map alluded to shows the proposed plan of improvement, and the estimates of cost are set forth in full detail at pp. 93 to 95 of the above mentioned Senate document.

They amount to the following sums, viz:

1. For close piling	$18,360 56
2. For two piers at the mouth of Grand river	134,047 20
3. For dredging	7,777 84
Total, to complete Grand river harbor, Michigan	160,185 60

In view of the pressing demand for this improvement, arising from the commercial connexion lately completed, through it, between the great eastern and western markets, added to the value of this harbor, when improved, as a harbor of refuge for the mid-coast on the east side of Lake Michigan, I would now recommend that the above sum be granted in two annual appropriations of $80,092 80 each.

13. SOUTH BLACK RIVER, MICHIGAN.

This place came under my official attention through the instructions of August 15, 1856, based on the resolutions of the United States Senate of the 4th of that month.*

The first step for me to take, in pursuance of this authority, was to cause to be made an accurate survey of the locality. This was done in the same month in which the resolutions of the Senate were passed, and the result of the survey was projected on a map marked G No. 50, now in the Topographical Bureau and in the archives of the United States Senate.

In my annual report for 1857, printed in Senate (Ex.) Doc. No. 42, of the 35th Congress, 1st session, the improvement of this harbor is treated of, see pp. 98 and 99.

An estimate was also presented for the necessary work, amounting to the sum of $39,180 61.

I beg leave to renew that estimate here.

14. KALAMAZOO RIVER, MICHIGAN.

Under the same authority as in the case of the next preceding harbor, I caused a survey to be made of the mouth of Kalamazoo river in September, 1856. The map projected from that survey, marked G No. 51, was forwarded to the Topographical Bureau with my annual report for 1857. A copy of it is in the archives of the United States Senate.

It shows the nature of the improvement which is desired by the people of the neighboring counties. The report and estimates in this case will be found printed in Senate (Ex.) Doc. No. 42, of the 35th Congress, 1st session, at pp. 99 and 100.

I beg leave to renew the estimate there given in detail, amounting to $64,099 63.

* See pages 97 and 98 of Senate (Ex) Doc. No. 42, of the 35th Congress, 1st session.

II. LAKE ST. CLAIR HARBOR WORKS.

15. MOUTH OF CLINTON RIVER.

No work has been carried on here for want of appropriations since 1855. My reports printed at pp. 468 to 471, and at pp. 473 to 479 of Senate Ex. Doc. No. 16 of the 34th Congress, 3d session, and at pp. 100 and 101 of Senate Ex. Doc. No. 42 of the 35th Congress, 1st session, give full details of all that concerns this improvement.

The estimate for completing this improvement is there given, amounting to	$31,920 00
From which deduct balance now on hand	200 38
Amount required for the completion of the improvement at the mouth of Clinton river, Michigan	31,719 62

For the want of means to complete what was begun here, the work has suffered as all unfinished work must when left exposed to the action of the waves and of the ice in winter. To secure it from further injury and to complete it, I would recommend that the said sum of $31,719 62 be granted in one appropriation.

III. LAKE ERIE HARBOR WORKS.

16. MONROE HARBOR, MICHIGAN.

This harbor suffered much from the storms of last winter and spring, and will no doubt suffer much more between the present time and next spring.

I recommend, in its behalf, a speedy appropriation of the amount of my estimate of last year, given in full detail at page 102 of Senate Ex. Doc., No. 42, of the 35th Congress, 1st. session.

It amounts to the sum of $23,857 90. No balance remains of the appropriation of 1852 for this work.

17. SANDUSKY HARBOR, OHIO.

The works for the protection of this harbor have suffered much since the period of my last annual report. This has been owing chiefly to their incomplete condition, and the unusually high stage of Lake Erie throughout the season of 1858. From this high stage of the water the works have in part, been submerged, and thereby much injured. I am obliged, therefore, to increase the estimates in order to prevent further injury, and to complete the harbor protection.

The importance of this harbor to the people of Ohio, and to the lake navigation demands that it should be immediately attended to.

I submit the following estimate for the accomplishment of this object, viz:

1. For the repair of 3,350 feet of pier work for the protection of the peninsula, at $2 50 per lineal foot	$8,375 00
2. For the construction of 4,060 feet of new pier work in continuation of said protection, at $5 per lineal foot	20,300 00
3. For a line of pier work between the western extremity of Peninsula Point and the main land. This will require 90 cribs, each 32 feet long, by 20 feet wide, and 15 feet high, at $1,200 per crib, to be constructed after the specifications contained in table T 1, at pp. 12 to 15 of Senate Ex. Doc., No. 16, of the 34th Congress, 3d session, and the drawings in map G 19, in the Topographical Bureau	108,000 00
4. For 450 feet lineal of pier work to connect the above (item 3) pier with the line of pier work now built, at $5 per lineal foot	2,250 00
Sum	$138,925 00
Add 5 per cent. for contingencies	6,946 25
Amount required for Sandusky harbor, Ohio	$145,871 25

In view of the great importance of this harbor, and the call for prompt attention to it, required by its present precarious condition, I recommend that the above sum be granted in two equal annual appropriations, each to be $72,935 62.

No balance remains of the former appropriation for this harbor.

18. HURON HARBOR, OHIO.

No balance remained for this harbor when it was turned over to me in December, 1856.

The works have suffered very much since the period of my annual report for 1857, and they are now in a very precarious condition, and nothing can be done for them until another appropriation shall be made..

To save these works from total destruction and to protect the harbor, I recommend the following repairs and improvements, with estimates of cost, viz :

1. *East pier.*

1. For the repair of 335 feet of this pier, by rebuilding on the old foundation to a height of five (5) feet above the water surface	$7,500 00
2. For the repair of 520 feet inside the harbor	4,500 00

3. For an additional crib at the lakeward extremity of this pier, thirty-two feet long and twenty feet high from the bottom to the top, to be in sixteen feet water	$3,525 00
Sum	15,525 00
Add ten per cent. for contingencies	1,552 50
Amount required for the east pier	17,077 50

2. *For the west pier.*

To rebuild 1200 lineal feet of pier, twelve feet wide, to a height of five (5) feet above the present water surface	25,500 00
Add ten per cent. for contingencies	2,550 00
Amount required for the east pier	28,050 00

Recapitulation.

1. For the east pier	17,077 50
2. For the west pier	28,050 00
Amount required for Huron harbor, Ohio	45,127 50

I recommend that this sum be granted in one appropriation.

19. VERMILLION HARBOR, OHIO.

The piers of this harbor are entirely decayed above the water level, and hence this portion of each must be renewed, to a height of six feet throughout.

Besides this general decay above the water level, the lakeward end of the east pier is dilapidated for a distance of 115 feet, to a depth of three and a half feet below the water level.

The following repairs are therefore required, for which I submit estimates, viz :

1. *The east pier.*

1. To raise 115 feet in length of this pier from three and a half feet below to five feet above the water level	$2,500 00
2. To rebuild 325 feet from the water surface to six feet above it	8,750 00
3. To repair 750 feet inland	9,987 50
Sum	21,237 50
Add ten per cent. for contingencies	2,123 75
Amount required for the east pier	23,361 25

2. *For the west pier.*

1. To build 135 feet to a height of 6 feet	$3,500 00
2. To rebuild from the water-level to 6 feet above the same, 1,000 feet	15,000 00
3. For repair of 450 feet of pier on its river face	1,875 50
Sum	20,375 50
Add 10 per cent. for contingencies	2,037 50
Amount required for the west pier	22,413 00

Recapitulation.

1. For the East pier	23,361 25
2. For the West pier	22,413 00
Amount required for Vermillion harbor, Ohio	45,774 25

I recommend that this sum be granted in one appropriation.

20. BLACK RIVER HARBOR, OHIO.

No funds remain of the last appropriation for this harbor, nor has any appropriation been made for it since the year 1852.

At that period only five thousand dollars ($5,000) were appropriated for it. This sum was very inadequate to the repairs then required, and the work of dilapidation has been going on from that time to this, so that the condition of this harbor is now such that if means be not very soon granted for its relief, it must be altogether lost to the object for which it was constructed.

The repairs now required, and the estimated cost of making them, are as follows, viz:

1. *For the east pier.*

1. To rebuild 354 feet of pier from 3 feet below the present water-surface to 5 feet above the same	$9,125 00
2. To rebuild and repair 700 feet from 1 foot below the water-surface to 5 feet above the same	6,785 50
3. To repair the inner face for 230 feet	1,115 76
4. For one additional crib at the extremity of this pier	3,500 00
Sum	20,526 26
Add 10 per cent. for contingencies	2,052 62
Amount required for the east pier	22,578 88

2. *For the west pier.*

1. For the repair of 150 feet of the north portion of this pier	$2,333 33
2. For rebuilding 250 feet on the inner end of pier	4,116 67
3. To repair 800 feet of pier inside of the harbor	5,250 00
Sum	11,700 00
Add 10 per cent. for contingencies	1,170 00
Amount required for the west pier	12,870 00

Recapitulation.

1. For the east pier	22,578 88
2. For the west pier	12,870 00
Amount required for Black river harbor, Ohio	35,448 88

I recommend that this sum be granted in one appropriation, because the dilapidated state of the work renders delay in effectually repairing it very hazardous.

21. CLEVELAND HARBOR, OHIO.

No appropriation has been granted for this harbor since that of 1842. The importance of this harbor to the general commerce of the lakes, and to a great portion of the State of Ohio, is too well understood to need any explanation here on the subject.

The outer end of the east pier, which is built of stone, is very much in need of repairs from the displacement of the stones arising from the action of the waves in rough weather. It is very important that this should be attended to with as little delay as possible. When dilapidation of a stone structure, like this, once begins, it is far more rapid and mischievous than in a wooden structure, unless immediately checked. It would be a great misfortune if this fine harbor should be allowed to deteriorate for want of these repairs, and they cannot be made until an appropriation is granted for the purpose.

The west pier should be completed.

For these objects I present the following estimate:

1. *The east pier.*

1. For repairing the outer end of this pier, by removing the stone from the injured portion, and rebuilding with the same	$8,433 66

2. For tearing away the wood work north of the position of the beacon, and building up with stone similar to the rest of this pier	$21,243 20
Sum	29,676 86
Add 10 per cent., for contingencies	2,967 68
Amount required for the east pier	32,644 54

2. *For the west pier.*

For completing the west pier according to the plan heretofore approved, and its connexion	23,120 00
Add 10 per cent., for contingencies	2,312 00
Amount required for the west pier	25,432 00

Recapitulation.

1. For the east pier	32,644 54
2- For the west pier	25,432 00
Amount required for Cleveland harbor, Ohio	58,076 54

I recommend that this sum be granted in one appropriation with a view to the completion of this very important work without further delay.

22. GRAND RIVER HARBOR, FAIRPORT, OHIO.

The last appropriation for this harbor was ten thousand dollars ($10,000,) made in the year 1852.

It was all expended by my predecessor more than three years ago in making the repairs that were most needed, and it was insufficient for all that were then required.

I repeat here the recommendations contained in my last annual report in regard to this harbor, which are:

1. That the east pier be extended, on its present direction, a distance of 416 feet, and that the west pier be extended 320 feet parallel with the east pier.

2. That a portion of the old pier work, which is rotten, be torn away and rebuilt with sound timber.

3. Dredging.

For these several objects detailed estimates were submitted with my annual report for 1857; to be fouud, marked K, at pages 108 and 109 of Senate Ex. Doc. No. 42 of the 35th Congress, 1st session, amounting to the sum of $41,498 94 as follows, viz:

1. For the pier extensions	$32,819 39
2. For tearing away old pier work and repairing	6,179 55
3. For dredging and repairs of steam dredge	2,500 00
Amount required for Grand River harbor, Fairport, Ohio	41,498 94

I renew this estimate and recommend that the amount be granted in one appropriation.

23. ASHTABULA HARBOR, OHIO.

The last appropriation made for this harbor was ten thousand dollars, ($10,000,) granted in the year 1852. It was expended by the end of the year 1855 in making repairs, and extending the harbor piers.

The old piers now require repairs to prevent breaches in them by the lake sea in high winds.

To complete this harbor, the windward pier should be extended out 416 feet, and the leeward pier 288 feet. This will require for the first, thirteen cribs, and for the second, nine cribs; or for both piers twenty-two cribs; each to be thirty-two feet long, twenty feet wide; and they will cost, each, $1,426 98, including all contingencies.

1. Hence, twenty-two cribs, at $1,426 98 each, gives for the pier extensions	$31,393 56
2. For repairs of the old piers	5,750 00
3. For dredging 12,500 cubic yards, at 14 cents per cubic yard	1,750 00
Total required for Ashtabula harbor, Ohio	38,893 56

I would recommend that this sum be granted in two annual appropriations, as follows, viz:

The first year	$25,000 00
The second year	13,893 56
Amount as before	38,893 56

24. CONNEAUT HARBOR, OHIO.

The last appropriation made for this harbor was ten thousand dollars, (10,000,) in the year 1852. No balance of that appropriation now remains. The whole was expended upon the work before I was placed in charge.

A new appropriation is now required to complete the piers here by extending them out to twelve feet depth of water at the mean stage of Lake Erie.

This will require an extension of the west pier of 352 and an extension of the east pier of 288 feet. The first will require an

addition of eleven (11) cribs, and the second an addition of nine (9) cribs; total twenty cribs, each thirty-two feet long, twenty feet wide, and twelve (12) feet average height from the bottom to the water surface. They will cost, each, $1,426 98.

1. Hence, twenty cribs, at $1,426 98 each, will cost	$28,539 60
To which add:	
2. For repairs of present piers	1,250 00
3. For dredging 18,000 cubic yards, at 14 cents per cubic yard	2,520 00
Amount required for Conneaut harbor, Ohio	32,309 60

I would recommend that this sum be divided into two annual appropriations, as follows, viz:

The first year	$20,000 00
The second year	12,309 60
Total, as above	32,309 60

25. ERIE HARBOR, PENNSYLVANIA.

This is the only harbor on the lakes which belongs to the State of Pennsylvania.

It is of great importance to her inland trade, and will be of still greater importance when the Sunbury and Erie railroad, now in progress of construction, shall be completed.

The grading is all completed for this road, and the rail track is mostly laid. It will be completed and in operation some time during the present winter, probably as early as January, 1859. It will open a direct communication between Philadelphia and Erie. It will constitute an important link, both for commerce and travel, lying entirely within the State of Pennsylvania and connecting her great Atlantic port with her only lake port. The route passes through a region of country abounding in agricultural and mineral wealth.

The State of Pennsylvania, through the influence of this great work of internal improvement, is deeply interested in the preservation of the harbor of Erie in good condition for the easy accommodation of the largest class of lake vessels.

The general commerce of the lakes must often look to this harbor, also, as a port of refuge from the frequent and sudden gales which prove every year so destructive to shipping and to human life. All these considerations, added to the value of this harbor as a naval station and port in time of war, seem to constitute a strong claim on the government to complete its improvement, and I would respectfully recommend immediate attention to it.

In my annual report for 1857, the repairs which were then required, in order to stop breaches in the piers of this harbor, were fully stated. An immediate appropriation for this especial object was urgently

recommended, but it was not granted. The additional dilapidation which has since taken place on portions of the piers which were built at an early period, makes a larger sum now necessary to put them in proper order.

The northwest channel pier is much injured in several places. The extreme crib, situated at the lake-ward extremity of this pier, is greatly damaged by the collision of vessels while entering the harbor in strong gales of wind.

The deepest water is near this point, and the channel being narrow here for the larger class of vessels, they are compelled, for fear of getting aground, to run close to this pier-head. Of course collisions will often take place in dark weather until the channel shall be widened here by dredging, a measure that ought, in our opinion, to be immediately resorted to. The beacon light formerly stood at the extremity of this pier, but its security having been rendered precarious by these collisions near its base, and by its having been once dragged down, as I was informed, by the yards of a vessel while passing close to the pier in entering the harbor, this beacon has, under the direction of the officer acting under the Light-house Board, been recently removed further inward and placed on a separate foundation beyond the reach of similar accidents.

There are four other bad breaches in this pier, which are growing worse every day. The first is 250 feet, and the second is 350 feet from the lakeward end of the pier. Each is about thirty (30) feet long, and if not soon repaired, they will grow into one wide breach of one hundred and sixty (160) feet in length, measured along the pier. There are two others further in towards the harbor, of twenty-five (25) feet length each.

This portion of the pier was constructed according to the old and now exploded fashion of using wooden pins (treenails) for fastening the timbers together, instead of bolts of wrought iron. The weight of the stone ballast within the cribs has, in many places, broken these treenails below the water level, and as a necessary consequence the same weight has pressed the timbers which form the main wall, or water-face of the pier, entirely out of place. Repairs are in such cases difficult and expensive. They can only be made by first tearing away the original work and rebuilding in place of it, or by protecting the whole water-face of the pier by means of close piling of oak timber, hewn or sawed one foot square, clear of sap.

The harbor, or bay-end of this pier, is entirely torn away above the water-level for a length of fifty (50) feet. It has been done by the collision of vessels, which, in order to keep in a sufficient depth of water, are obliged to pass within twenty (20) feet of this point. The channel should be widened here by dredging. The immersed part of the pier should be built up again to its proper height above the water. In its present condition, being concealed from view, it is dangerous to every vessel that passes down.

The north breakwater pier was injured by autumn and winter gales, so frequent since the date of my last annual report. Its repair was then estimated to cost $1,873 00. It is now estimated at $2,375 00,

as will appear by the item in the accompanying estimate, marked D 1.

This structure, like the one previously mentioned, is much weaker from the fact that wooden trenails were used for binding the timbers together. Iron bolts cannot, I conceive, be dispensed with for such a purpose, and there is economy in the end produced by the free use of the best American wrought iron for all such purposes.

The brushwood (facines) placed by the late Colonel William Turnbull to stop the breach near Peninsula Point, has proved of good effect. The depth in this breach is now greater than usual, owing to the present unusual height of the surface of Lake Erie.

I recommend that this mode of closing this breach, and the like one of protecting the lakeward shore of the island from further abrasion, be persevered in.

Dredging is immediately required along the channel between the piers, and near the entrance from the lake.

I would recommend that the northwest channel-pier be extended out 224 feet by the addition of 7 (seven) cribs, each thirty-two feet long, twenty feet wide, and of an average height of twenty feet from bottom to top.

The Sunbury and Erie Railroad Company has constructed a line of pier work, consisting of a succession of detached cribs parallel to the old United States eastern, or southeastern channel pier, and nearer to the southeastern shore of the bay. The channel bounded by this company's pier on the one side, and the United States northwestern channel pier on the other, is thus much widened and better adapted to the present state of the lake commerce carried on at this port. It is not now, therefore, recommended to repair this old United States southeastern channel pier.

It is probable that it may become necessary at a future time, not far distant, to remove the greater portion of it.

For the objects above specified I beg leave to refer to the accompanying estimates marked D 1, amounting as follows, viz:

1. For the repair of the northwestern channel pier	$4,500
2. For the repair of the north breakwater pier	2,350
3. For dredging the channel within the bay, and also the ship entrance lakeward of the channel piers	15,000
4. For stopping the breach near Peninsula Point	2,200
5. For protecting the lakeward shore of the island from abrasion	3,500
6. For extending the northwest channel pier	14,840
Amount required for Erie harbor, Pennsylvania	42,590

In view of the great value of this harbor to the lake-coast commerce, as well as to a very large portion of the people of Pennsylvania, I recommend that this sum be granted in one appropriation.

The appropriation for this harbor made in 1852 having been

expended, it became my duty under the regulations of the War Department, to dispose if possible by sale of the public property which remained unapplied to the works, and from the proceeds to close all outstanding accounts against said harbor.

Accordingly in April, 1857, I directed the custodian of the property there to advertise it for sale, and to invite bids for it. This was done by advertisements in the "Erie Weekly Observer." from the 11th to the 25th of April, 1857. A copy of that advertisement is hereto attached, marked D 2. No bids were, however, received; nor could the custodian succeed in disposing of the property on any terms short of a complete sacrifice, about equivalent to giving it away.

Again I caused this property to be advertised both in the "Erie Weekly Observer" and also in the "Buffalo (N. Y.) Daily Courier, from January 30 to March 4 and 6, and thence again to April 1, 1858, and every effort within my power was made to dispose of it on any thing like reasonable terms, but without success. No bids were offered.

The quarterly returns will show that this timber cost the United States more than three thousand dollars, ($3,000,) and I could not abandon it in order to discharge the custodian. Yet there was no money to pay him his monthly wages.

The timber is still valuable for the purposes of the United States in making the repairs that must go on at Erie so soon as another appropriation shall be made. It gives the custodian, however, a claim for his services beyond the time that there was any money to pay him, a case which is anomalous under the rule laid down for the sale of public property when an appropriation shall be exhausted.

I submit it for the decision of the proper authority.

After I reported the condition of the United States steam dredge-boat for Lake Erie, by my letter No. 183, of September 3, 1857,* and also after I received the authority to repair her, contained in your reply of November 11, 1857,* I found that she lay sunk in the dock at Erie from a hole in her bottom made by getting on her anchor.

I made arrangements with a party at Buffalo, New York, to raise and repair her; but on a personal inspection of her in the early part of August last, I came to the conclusion that she was safer as she lay, inasmuch as her machinery had been taken out and stored ashore, and there were scarcely funds enough to raise her and put her on a dry dock and repair her. She lies in a safe position and will be less liable to injury than if raised and left unemployed.

When a new appropriation shall pass for her employment she will be properly attended to.

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* See documents marked L 6, and L 7, at pages 117 and 118 of Senate Ex. Doc. No. 42 of the 35th, Congress, 1st session.

D 1.

Estimate of the cost of repairs immediately required at Erie harbor, Pennsylvania, of extending the northwestern channel pier 224 feet lakeward, and of dredging.

1. Repair of the northwestern channel pier:

For repairing the lakeward end of this pier by tearing away the timber work to the lowest water surface, and then building up and filling with stone to the flooring at top	$1,500 00
For repairing four breaches in this pier, described in the report	1,425 00
For rebuilding 50 feet in length of the bay end of this pier, to a height of 5 feet above the high water level	1,575 00
Total for the northwest channel pier	$4,500 00

2. For the repair of the north breakwater pier:

For materials and workmanship	$2,350 00

3. For dredging:

For excavating and removing 25,000 cubic yards from the channel of the inner bay, at 20 cents per cubic yard	$5,000 00
For excavating and removing 20,000 cubic yards from the outer bar, at 50 cents per cubic yard, being rocky in many places	10,000 00
Total for dredging	15,000 00

4. For stopping the breach near Peninsula point with brush wood	$2,200 00
5. For protecting the lakeward shore of the island from abrasion by brush wood	$3,500 00

6. For extending the northwest channel pier 224 feet lakeward:

This will require seven cribs, each 32 feet long, 20 feet wide, and of an average height of 20 feet from bottom to top. This will require seven cribs to be constructed as per the drawings in the sheet marked G 20, in the Topographical Bureau, and the specifications in the table marked T 2, printed at pp. 16 to 18 of Senate Ex. Doc. No. 16, of the 34th Congress, 3d session. The cost of each crib is estimated at $2,120. Therefore for the 7 cribs	$14,840 00

Recapitulation.

1. For the repair of the northwestern channel pier	$4,500 00
2. For the repair of the north breakwater pier	2,350 00
3. For dredging the channel within the bay, and also the ship entrance lakeward of the channel piers	15,000 00
4. For stopping the breach near Peninsula point with brush wood (facines)	2,200 00
5. For protecting the lakeward shore of the island from abrasion	3,500 00
6. For extending the northwest channel pier	14,840 00
Amount required for Erie harbor, Pennsylvania	42,590 00

J. D. GRAHAM,
Major Corps of Top'l. Eng'rs, Bvt. Lieut. Col. Sup'tg Eng'r.

OFFICE GENERAL SUPERINTENDENCE OF LAKE HARBOR WORKS,
Chicago, November 15, 1858.

D 2.

[From the Erie (Pa) Weekly Observer, from April 11 to April 25, 1857.]

Government timber for sale.

Sealed proposals will be received by the undersigned until the 1st day of May, for the following lot of white oak, cucumber, ash, and hemlock timber, lying on the bank of the lake at the foot of Holland street, at A. J. Kelso's warehouse, and at north end of the bay, near the old carpenter shop.

198 white oak piles 12 by 12 inches, 24 feet long.

4,520 feet, board measure, white oak timber, 12 by 12 inches, 30 feet long and 6 by 10, 14 feet long for dock timber and ties, square hewed, full corners.

176,294 feet, hemlock, same size as No. 146,620 feet, board measure. Cucumber and ash, same size and length as white oak.

The bids should be made by the thousand feet, board measure.

Terms of sale cash, 20 per cent. in hand on day of sale, balance as soon as measured and delivered.

J. J. LINTS,
United States Agent and Custodian.

ERIE, *April* 11, 1857.

[January 30 to March 6, 1858.]

Estimate of the cost of [illegible] *mber for sale.*
Pennsylvania, of exte
ward, and of dredg

[illegible] ved until the 1st day of April, 1858, [illegible] at Erie, Pennsylvania, viz: White oak, [illegible] timber, lying on the bank of the lake at [illegible] at A. J. Kelso's warehouse, and at the [illegible] the old carpenter shop. Dimensions as follows, viz:

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	Length.	Size.
3,744 cubic feet of white oak	24 feet	12 x 12
133 cubic feet of white oak	20 feet	6 x 10
5,040 cubic feet of cucumber and ash	30 feet	12 x 12
160 cubic feet of cucumber and ash	16 feet	12 x 12
3,075 cubic feet of cucumber and ash	20 feet	8 x 8
64 cubic feet of cucumber and ash	16 feet	8 x 8
10,200 cubic feet of hemlock	30 feet	12 x 12
112 cubic feet of hemlock	16 feet	12 x 12
1,777 cubic feet of hemlock	20 feet	8 x 8

2.
F

The bids should be made for the cubic foot, for each kind of timber separately. Parties can bid for the whole or in parcels to suit. All proposals must be addressed to Lieutenant Colonel J. D. Graham, superintending engineer of lake harbors, Chicago, Illinois, and will be subject to the decision of that office. Terms of sale: Specie of United States coin, to be paid as soon as measured and delivered.

ERIE, *January* 30, 1858.

D 4.

[From the Buffalo (N. Y.) Daily Courier, from January 30 to March 4, 1858, and thence to April 1, 1858.]

Government timber for sale.

Sealed proposals will be received until the first day of April, 1858, for the following lot of timber, at Erie, Pennsylvania, viz: White oak, cucumber, ash, and hemlock timber, lying on the bank of the lake, at the foot of Holland street, at A. J. Kelso's warehouse, and at the north end of the bay, near the old carpenter shop. Dimensions as follows, viz:

	Length.	Size.
3,744 cubic feet of white oak	24 feet	12 x 12
133 cubic feet of white oak	20 feet	6 x 10
5,040 cubic feet of cucumber and ash	30 feet	12 x 12
160 cubic feet of cucumber and ash	16 feet	12 x 12
3,075 cubic feet of cucumber and ash	20 feet	8 x 8

	Length.	Size.
ubic feet of cucumber and ash	16 feet	8 x 8
bic feet of hemlock	30 feet	12 x 12
c feet of hemlock	16 feet	12 x 12
bic feet of hemlock	20 feet	8 x 8

oids should be made for the cubic foot, for each kind of timber rately. Parties can bid for the whole or in parcels to suit. All oposals must be addressed to Lieutenant Colonel J. D. Graham, superintending engineer of lake harbors. Chicago, Illinois, and will be subject to the decision of that office. Terms of sale: specie of United States coin, to be paid as soon as measured and delivered.

ERIE, *January* 30, 1858.

26. DUNKIRK HARBOR, NEW YORK.

In regard to this harbor I will refer to my annual report of last year. It is printed at pp. 119 to 122 of Senate Ex. Doc. No. 42 of the 35th Congress, 1st sesion.

The estimate then submitted for repairs was $5,299 96. Nothing was however appropriated and the works have suffered so much that I am obliged now to ask for $7,320 for that purpose.

In addition to this item I recommend that $80,363 73 be appropriated for continuing this work, which, added to the above item for repairs, makes the sum of $87,683 73 as required for this work by the first appropriation.

27. BUFFALO HARBOR, NEW YORK.

No work has been done at this harbor, for want of means, since 1856. It is in a worse condition than that which was stated in my annual report for 1857. The sum of $27,679 35 was then estimated as necessary for repairs. I estimate that $30,000 (thirty thousand dollars) are now necessary for the repairs of the parts specified in that report, and I would recommend that it be granted in one appropriation. Please see my report for 1857 on this harbor, printed at pp. 122 and 123, inclusive, of Senate Ex. Doc. No. 42 of the 35th Congress, 1st session.

AN ADDITIONAL STEAM DREDGE BOAT FOR LAKE ERIE.

I beg leave here to renew my recommendation for an additional steam dredge boat and six mud scows for Lake Erie, and to refer you to my views on this subject as expressed in my annual report for 1857, printed at pp. 123 to 126 of Senate Ex. Doc. No. 42 of the 35th Congress, 1st session, and also to the estimates therein given in full detail of items, amounting to the sum of $19,232, which I would recommend to be granted in one appropriation, at as early a day as may be considered expedient.

Also the sum of $1,950 for raising and repairing the United States steam dredge boat now lying at Erie, as per estimate printed at page 126 of said document.

IV. LAKE ONTARIO HARBOR WORKS.

28. OAK ORCHARD HARBOR, NEW YORK.

The balance of the last appropriation for this harbor was expended in dredging in the summer and autumn of 1857.

The benefit of that work continues to be felt and appreciated, and it is very desirable that it should be pushed still further.

I beg leave here to renew my estimate of last year for the completion of this harbor on the plan therein referred to. The whole subject will be found in my annual report for that year, as printed in Senate Ex. Document No. 42 of the 35th Congress, 1st session, at pp. 127 to 137, inclusive.

The estimates are given in full detail at pp. 136 and 137.

The items are as follows, viz:

1. For the pier extensions	$46,927 80
2. For dredging	4,834 10
Total for completing Oak Orchard harbor, New York	51,761 90

I would recommend that this sum be granted in three equal annual appropriations, each of $17,253 97

To which add the amount required immediately for repairs, as per estimate marked O 13, at page 136 of the above mentioned document	9,736 65
Amount required for the first year's appropriation for Oak Orchard harbor, New York	26,990 62

29. GENESEE RIVER HARBOR, NEW YORK.

This harbor is at the mouth of Genesee river. It was formerly called Charlotte harbor.

The last appropriation by Congress was twenty thousand dollars ($20,000) for this harbor, in the year 1852. It was nearly all expended the following year, under the direction of Colonel Turnbull, in repairing the west pier, which is 1,943 feet long, and was in a very bad condition before he had it attended to.

The east pier was reported by Colonel Turnbull, as long ago as September, 1853, to be in a very bad condition, and an appropriation of $21,530 was recommended by him for its repair; but it was not granted, and the dilapidation went on to such a degree that it must now be entirely rebuilt from two feet below to five feet above the water level. There are also portions that are dilapidated to a great depth below the water surface, and as that distinguished and much lamented officer justly stated in his annual reports for 1855 and 1856, "in moderate gales of wind it is entirely submerged, which renders the approach of vessels to the entrance very dangerous."

For the repairs now required I present the estimate herewith, marked E, amounting to $41,084 34.

In order to the timely saving of the harbor, it would be judicious grant this sum in one appropriation.

E.

Estimate of the cost of repairing the East pier of Genesee River harbor, by tearing away the old work to two feet below the water level, and then building up to five feet above that level. Total height of new work, 7 feet.

For 76,288 lineal feet of oak timber hewn or sawed 1 foot square, at 18 cents per foot	$13,731 84
For 95,488 feet, board measure, of white oak plank 3 inches thick and 8 inches wide, in pieces 20 feet long, for flooring, at $18 per M	1,718 78
For 67,392 pounds of wrought iron, 1 inch square, for bolts, at 4 cents per pound	2,695 68
For 8,768 pounds of wrought iron spikes ⅜ inch by ⅜ inch square, at 7½ cents per pound	657 60
For 1,376 cords of ballast stone, at $3 50 per cord	4,816 00
Cost of materials	23,619 90
For superintendence, carpentry and labor, at $120 per 32 lineal feet	7,627 50
Cost of new work	31,247 40
For tearing away and removing the materials of the old decayed work, 2,034 lineal feet, at $3 per lineal foot	6,102 00
Sum	37,349 40
Add 10 per cent for contingencies	3,734 94
Amount required for Genesee River harbor, New York	41,084 34

J. D. GRAHAM,
Major U. S. Corps Top. Eng., Bvt. Lt. Colonel, Supt'g Engr.

OFFICE GENERAL SUPERINTENDENCE OF LAKE HARBOR WORKS,
Chicago, November 15, 1858.

30. SODUS BAY HARBOR, WAYNE COUNTY, NEW YORK.

There has been no appropriation for this harbor since 1852, when there was one of ten thousand dollars, ($10,000.)

This was entirely inadequate to the repairs of the piers then needed. It was nearly all expended in 1853, under the late Colonel

Turnbull, in repairing east channel pier, and a part of the east harbor pier.

The remainder of the east harbor pier, and also the entire west pier from the point formerly occupied by the beacon light to the beach, is entirely rotten, and both must be rebuilt from two feet below the water level to five feet above that level.

It was predicted in my last annual report that unless repairs were soon made, this beacon-light would be overthrown by the first severe storm.

The prediction was verified in November, 1857, much to the inconvenience of navigation here.

For full information respecting this harbor, the dredging which was done there under my direction last season, the improvements that are projected to connect with it, and the amount necessary to complete it, I beg to refer to my last annual report, which is printed in Senate Ex. Doc. No. 42, of the 35th Congress, 1st session, at pp. 139 to 147.

I beg leave also to renew my estimate, therein presented in full detail, marked Q 1, at page 141, amounting to..... $40,806 00

In order to save this harbor, I recommend that the above sum be granted in one appropriation.

31. SODUS BAY HARBOR, CAYUGA COUNTY, NEW YORK.

The only appropriation for this work was ten thousand dollars, ($10,000,) in 1852.

The work was commenced in the year 1854, and two hundred and forty (240) feet in length of the west pier was built, and a deposit of stone was made to connect it with the west shore of the bay, in order to the formation of a beach which proved advantageous.

A channel eight feet deep was excavated from the bay to the lake. Want of means has prevented the continuation of the work by the United States.

For full information in regard to the great natural advantages of this harbor, and the improvements which have already been connected with it, and those which are going on, I beg to refer to the part of my annual report for 1857, printed at pp. 147 to 153 in Senate Ex. Document No. 42, of the 35th Congress, 1st session.

I also beg to renew my estimates for this work, which will be found printed in full detail of items at pp. 148 and 149 of said document, amounting to $52,602 18.

I recommend that this sum be granted in two annual appropriations, as follows, viz:

The first year	$30,000 00
The second year	22,602 18
Amount, as above, required for Sodus Bay harbor, Cayuga county, New York	52,602 18

The larger sum is required the first year in order to procure the necessary materials and machinery in advance.

32. OSWEGO HARBOR, NEW YORK.

The precarious condition of the works for the protection of this admirable commercial port was fully set forth in my annual report for 1857, and an appropriation was earnestly asked for, in order to enable us to commence with the opening of the spring of 1858 the repairs which were most needed. Unfortunately no aid was granted, and, as was fully anticipated and predicted in such an event, the work of dilapidation has gone on since the date of that report at a fearful rate.

It has been painful to look on and see portions of that structure, consisting of heavy stone masonry, crumble in our very sight, without the means to check the work of desolation.

A timely appropriation would have saved a very large expenditure, which must now be applied to putting the works in an efficient and safe condition. The local authorities have liberally contributed a portion of the means necessary for the most urgent of the repairs that were needed, but they were not adequate for the remedy of the whole evil.

I would refer here to my report on this harbor, as printed at pp. 153 to 171 in Senate Ex. Document No. 42, of the 35th Congress, 1st session.

At pp. 155 and 156 will be found an estimate in detail for what was then needed, amounting to $46,391 44.

The best I can now do is to renew that estimate with an increase of fifteen per cent., that is to say, $6,958 71 for the increased damage which the work has sustained since the date of that report, which will bring the sum now required for this harbor to the sum of $53,350 15.

This sum judiciously applied would put the harbor works in a secure condition, and I would respectfully recommend the granting of it in one appropriation.

33. OGDENSBURG HARBOR, NEW YORK.

In regard to this harbor I beg to refer to my last annual report as embodying all the information I have to offer in reference to it. I would renew the recommendation therein contained that an appropriation of twenty thousand dollars ($20,000) be granted for this harbor, to be applied according to such plan as may be presented to the War Department and approved by it.—(See page 171 of the above mentioned Senate document.)

AN ADDITIONAL STEAM DREDGE BOAT FOR LAKE ONTARIO.

I beg to renew here my recommendation of last year that an additional steam dredge, with six mud scows, be immediately constructed for the harbors on Lake Ontario. The importance of dredging was fully discussed in that report and need not be repeated here.

I renew the estimate given at page 172 of the above mentioned Senate document, amounting for this object to $19,232.

V. LAKE CHAMPLAIN HARBOR WORKS.

34. BURLINGTON BREAKWATER, VERMONT.

No appropriation having been granted for this work since it was committed to my charge, nothing has been done within that period.

The work, although highly useful in its present condition, requires to be extended on the plan described in my annual report in order to afford a more complete shelter from northwest winds to vessels seeking a safe anchorage behind it.

For this purpose, and certain repairs that are much needed, I beg to renew the estimate which I presented in full detail with my last annual report, to be found at pages 172 to 174 of the above mentioned Senate document.

The items are as follows, viz:

1. For completing unfinished work and for repairs	$2,186 40
2. For extending the breakwater 200 feet to the northward	19,099 91
Amount required to complete the Burlington breakwater, Vermont	21,286 31

35. THE FOUR STEAM DREDGE BOATS ON THE LAKES.

There are now four steam dredge boats on the lakes within the district assigned to my charge, namely: One on Lake Michigan, one on Lake Erie, one on Lake Ontario, one on Lake Champlain.

There is no more vital interest to the lake harbors than that these valuable machines should constantly be kept, together with their attendant mud-scows, in good working condition.

A special appropriation is however absolutely necessary for this purpose.

I would earnestly recommend that, for this especial object, there be appropriated for each of these machines and its appurtenances, including the scows, the sum of $2,500; or—

For the four machines and their appurtenances $10,000

36. THE NEW LIGHT-HOUSE FOR CHICAGO HARBOR.

This work has demanded much of my attention the present year. The position adopted for it is the most advantageous to mariners, because it is situated at the critical point in entering the harbor of Chicago,* and besides it serves the double purpose of a coast light and a harbor beacon.

* See map G, No. 52. Also, Senate Executive document No. 16, of the 34th Congress, 3d session, pages 102, 103, &c.

At the same time that it secures these eminent advantages the work, while going on, was almost constantly exposed to the violent action of the lake sea, owing to a prevalence of easterly winds, and my personal attention during a great part of the working season had to be given to this work to prevent disasters, loss of machinery, materials, &c.

While my report on the progress of this light-house is due and will be made to the Light-house Board, it seems proper that I should here say this much on the subject.

The peirs of defence are completed on the lakeward sides, and but for unusually rough weather in October and November; the new light would have been shown to mariners the present season.

All of which is respectfully submitted,

J. D. GRAHAM,
Major U. S. Corps of Top'l Eng'rs, Bvt. Lieut. Colonel,
Superintending Eng'r of Lake Harbor Works.

Colonel J. J. ABERT,
Chief Top'l Engineer, Washington.

P. S.—I submit the following recapitulation of items in the foregoing estimates:

RECAPITULATION OF THE ESTIMATES.

Amount of the estimated cost of the completion of the several lake harbor improvements on the northern and northwestern lakes, under the superintendence of Brevet Lieutenant Colonel James D. Graham, major of Topographical Engineers, together with the sums asked the first year towards that object.

Name and nature of work.	Amount required to complete the work.	Sum asked for the first year.
I.—LAKE MICHIGAN HARBOR WORKS.		
1. Chicago harbor, Illinois. Extension and repair of the piers, and dredging, &c.	$219,342 96	$109,671 48
2. Waukegan harbor, Illinois. Construction of 1,380 feet of breakwater	137,966 10	60,000 00
3. Kenosha harbor, Wisconsin. Extension of piers, chevaux-de-frise, sand barrier, dredging basins to give capacity for a harbor of refuge, and removing the bar and deepening the channel between the piers	58,047 24	58,047 24
4. Racine harbor, Wisconsin. Extension of the harbor piers and making a survey of the harbor and dredging	25,422 73	25,422 73
5. Milwaukie harbor, Wisconsin. Repairs of piers at the natural mouth of the river, and dredging	44,631 42	44,631 42
6. Sheboygan harbor, Wisconsin. Extension of piers, repairs and dredging	36,614 55	36,614 55
7. Manitowoc harbor, Wisconsin. Extension of piers and dredging	62,780 94	40,000 00
8. Michigan City breakwater, Indiana. For 2,000 feet of breakwater to form a roadstead for the general commerce of the lakes and for armed vessels	384,376 50	100,000 00
9. New Buffalo harbor, Michigan. For the construction of 1,200 feet of pier work, piling, excavation, and dredging channels and basins, to adapt it as a harbor of refuge to the wants of the local commerce of the place	98,113 47	60,000 00
Additional to render it suitable for a harbor of refuge for the general commerce of the lakes and for armed ships	69,494 32	
10. St. Joseph's harbor, Michigan. Construction of piers, tearing away old work, repairs, and dredging	97,633 91	97,633 91
11. Black Lake harbor, Michigan. Pier construction, close piling, pile-wharfing, excavation, and dredging	128,343 02	42,781 00
12 Grand River harbor, Michigan. Pier construction, close piling, and dredging	160,185 60	80,092 80
13. South Black river, Michigan. Pier construction and dredging	39,180 61	39,180 61
14. Kalamazoo river, Michigan. Pier construction, close piling, and dredging	64,099 63	32,049 81
II.—LAKE ST. CLAIR HARBOR WORKS.		
15. Mouth of Clinton river, Michigan. Close piling and dredging	31,719 62	31,719 62
III.—LAKE ERIE HARBOR WORKS.		
16. Monroe harbor, Michigan. Pier extension, repairs, and dredging	23,857 90	23,857 90

RECAPITULATION—Continued.

Name and nature of work.	Amount required to complete the work.	Sum asked for the first year.
17. Sandusky harbor, Ohio. Pier and breakwater cribwork and repairs	$145,871 25	$72,935 62
18. Huron harbor, Ohio. Pier construction, rebuilding and repairing, and dredging	45,127 50	45,127 50
19. Vermillion harbor, Ohio. Erecting and repairing piers	45,774 25	45,774 25
20. Black River harbor, Ohio. Rebuilding and repairing piers	35,448 88	35,448 88
21. Cleveland harbor, Ohio. Tearing away old work, rebuilding and repairing piers	58,076 54	58,076 54
22. Grand River harbor, Fairport, Ohio. Pier extension and repairs and dredging	41,498 94	41,498 94
23. Ashtabula harbor, Ohio. Pier construction and repairs and dredging	38,893 56	25,000 00
24. Conneaut harbor, Ohio. Pier erection and repairs and dredging	32,309 60	20,000 00
25 Erie harbor, Pennsylvania. Completing the harbor according to the plan of the board of engineers, (not included)		
For immediate dredging and repairing of breaches	42,590 00	42,590 00
26. Dunkirk harbor, New York. To complete the harbor on the plan of the board of engineers, *i. e.:*		
For eastern, middle, and western breakwaters	401,818 66	87,683 73
For immediate repairs of breaches	7,320 00	
27. Buffalo harbor, New York. For repairs of piers, rebuilding wall, and dredging	27,679 35	27,679 35
IV.—LAKE ONTARIO HARBOR WORKS.		
28. Oak Orchard harbor, New York. For extending the harbor piers, repairs of the present piers, and dredging	61,498 55	26,990 62
29. Genesee River harbor, New York. For tearing away old work above low-water level and rebuilding the same	41,084 34	41,084 34
30 Sodus Bay harbor, Wayne county, New York. For tearing away old pier work above low-water level, rebuilding the same, and dredging	40,806 00	40,806 00
31. Sodus Bay harbor, Cayuga county, New York. For pier extension and dredging	52,602 18	30,000 00
32. Oswego harbor, New York. For repairs of wood and stone pier works and dredging	53,350 15	53,350 15
33. Ogdensburg harbor, New York. For improvement of	20,000 00	20,000 00
V.—LAKE CHAMPLAIN HARBOR WORKS.		
34. Burlington harbor, Vermont. Breakwater extension, and completing unfinished work and repairs of old work	21,286 31	21,286 31
a. For surveys of harbors and inlets on the coast of Lake Michigan, to ascertain what other harbors on said lake require improvement, (not included)		
b. For an additional steam dredge boat and eight scows for Lake Erie	19,232 00	19,232 00
c. For repair of the present steam dredge boat and her four scows on Lake Erie	1,950 00	1,950 00

RECAPITULATION—Continued.

Name and nature of work.	Amount required to complete the work.	Sum asked for the first year.
d. For an additional steam dredge boat and eight scows for Lake Ontario	$19,232 00	$19,232 00
e. For repairs of the four steam dredge boats now on Lakes Michigan, Erie, Ontario, and Champlain, $2,500 each	10,000 00	10,000 00
Total	2,945,260 58	1,667,449 30

J. D. GRAHAM,
Major Topographical Engineers, Brevet Lieut. Colonel,
Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE HARBOR WORKS,
Chicago, November 15, 1858.

Colonel J. J. ABERT,
Chief Topographical Engineer, Washington.

APPENDIX D.

OFFICE OF UNITED STATES GOVERNMENT ROADS,
St. Paul, Minnesota, October 15, 1858.

COLONEL: By Special Orders No. 64, dated April 20, 1858, I was instructed "to relieve Captain George Thom, Corps Topographical Engineers, in the charge of military roads in Minnesota Territory." I accordingly proceeded to St. Paul, Minnesota, and received from Captain Thom a succinct and lucid report of the progress that had been made in the several works under his charge since the transmission of his annual report to the bureau, dated September 5, 1857. I cannot give a better view of these operations than by inserting such portions of his report as are necessary for that purpose. In this report, he says:

For a knowledge of the condition of the several roads heretofore under my charge, I have to refer you to my last annual report to the Topographical Bureau, and to present in connexion therewith, the following statement of the progress since then made on each of them:

Road from Point Douglas to the mouth of St. Louis river.—The *survey* and *location* of this road throughout its whole extent (178 miles) is completed. Between the 109th mile, near Deer creek, and 152d mile station, its location has been shortened and otherwise much improved as will appear from the maps and notes in this office. So also has the first 19 miles out from Point Douglas been improved.

The *construction* of the unfinished portion of the road, situated between Point Douglas and Stillwater was completed on the 30th ultimo, (April,) by the contractors, Messrs. S. W. Furber, and J. W. Hamilton. The repairs of Kettle R. bridge were completed in March last under the immediate direction of Mr. J. S. Sewall. The cost was greater than was at first anticipated owing to the exceedingly defective condition of the materials and workmanship of the structure, discovered whilst undergoing repairs.

From the 108th to the 111th mile station, the road was grubbed out last season under a contract (since closed) with Mr. John D. Ludden. The delays attending the recommencement of the operations on the part of the contractor, and the necessary suspension of the same caused by the early approach of winter prevented further progress.

From the 141st to the 157th mile station, the road was also grubbed out last season under a contract (since closed) with Mr. Orrin W. Rice. This work was rapidly and satisfactorily carried on until suspended by the early winter.

The "middle section" of this road (extending from the 106th to the 141st mile station) remains to be grubbed, nearly the whole of it, and to be otherwise more or less constructed. This work is now in progress under a contract made on the 10th of March last, with Mr. Patrick Ryan, of St. Paul. * * * On the completion of the "middle section" an additional appropriation will be requisite to render the road good and practicable throughout in all seasons of the year, as recommended in my last annual report. * * *

Road from Point Douglas to Fort Ripley.—The unfinished portion

of this road, situated between Point Douglas and St. Paul was completed on the 18th instant, (May,) by Mr. Patrick Ryan under his contract, dated the 26th of September last. The work was commenced last autumn, but was suspended on account of the early severity of the season.

The bridge at Anoka, over Rum river, was repaired in November last.

This road is now completed throughout its whole extent. The appropriation is exhausted, and there are no arrearages whatever.

Road from Mendota to Wabashaw.—The bridge over Cannon river, on this road, near Red Wing, was completed in November last, under a contract made with the county commissioners of Goodhue county.

The road is completed throughout its whole extent. The appropriation is exhausted, and there are no arrearages whatever.

Road from Mendota to the mouth of the Big Sioux river.—This road has been more or less constructed from Mendota as far as the 96th mile station; much, however, remains to be done thereon to make it a good practicable road. The amount stated in my last annual report will be required for its total completion. As far as constructed, it was in September last surveyed; and maps thereof have been made in duplicate, showing its location. No other work has been expended thereon since my last annual report.

The appropriation is exhausted, and there are no arrearages.

Territorial road from the Falls of St. Anthony to Fort Ridgely.—The work on this road was completed in December last by the contractors, Messrs. A. C. Smith and J. W. McComb.

The appropriation is exhausted, and there are no arrearages.

Road from Fort Ripley, via Crow-wing river, to intersect the main road leading to the Red River of the North.—This road was surveyed and located last season from Fort Ripley as far as the 95th mile station, and thence surveyed and reconnoitered as far as its intersection with the main road leading to the Red River of the North—in all, 138 miles.—(See my special report to the Topographical Bureau under date of January 25, 1858, transmitting a map and estimate for its construction.) A contract, dated the 13th ultimo, (April,) has been made with Mr. Thomas J. Frazier, of St. Paul, for the construction of the first section, extending from Fort Ripley to the crossing of Crow-wing river, a distance of 37½ miles. This work is now in progress, under the immediate superintendence of Mr. George H. Belden, assistant engineer, and it is to be completed on or before the first of September next. * * * * * *

To complete this road throughout its whole extent will require the additional appropriation recommended in my special report of the 25th of January last.

Road from Swan river to Long Prairie.—Road completed; appropriation exhausted, and no arrearages.

From the above report of Captain Thom, it will be seen that the only operations in progress at the time I took charge of these works were on the "road from Point Douglas to the mouth of St. Louis river" and that from "Fort Ripley, via Crow-wing river, to the main road leading to the Red River of the North," both under con-

tract entered into by my predecessor and approved by the War Department.

There being no funds available for the only other road unfinished in the State, viz: that from Mendota to the Big Sioux river, my duties have been confined to the two roads above mentioned.

The location of the several roads in Minnesota for which appropriations have been made by Congress, (incorporating the results of the careful and minute surveys instituted by my predecessor, Captain Thom, in 1857,) will be found indicated upon the general map prepared to accompany this report.

1. *Road from Point Douglas to the mouth of St. Louis river.*— Owing to the prevalence of high waters to an unusual degree during the months of July and August, the contractor was much retarded, and at length obliged to suspend work for five weeks. He has, however, resumed operations, and has reported his contract completed as far as Kettle river. The assistant engineer has been directed to inspect and measure the work previous to its acceptance. The advance of the season and the state of the funds available for this road, will prevent any further work being done under this contract the present season, leaving its completion dependent upon further appropriations. The work done consists of grubbing, clearing, and levelling, 18 feet wide, from the 111th mile (the point at which the work was discontinued last autumn) to the south bank of Kettle river, at the 121st mile, with corduroying, ditching, and some grading at points where absolutely indispensable; also, of "levelling off" for one-quarter mile on the 108th and 109th mile of grubbing left unfinished by contractor Ludden in 1855, and about a mile of similar work on the 111th and 112th mile, left uncompleted by the same contractor last season in consequence of the early setting in of winter. The contract provides for the completion of 19 miles more on this section, (the "middle,") north of Kettle river; the funds being insufficient for this purpose, that part of the section is included in the estimate herewith submitted.

The assistant engineer in charge of this road is Mr. Christopher N. Thom.

The estimate submitted by my predecessor for the completion of this road amounted to $44,200, but the experience of the present season, which has been one of unusual high water, (the low and swampy grounds being overflowed to a greater depth and extent than had been anticipated,) has shown that sufficient provision had not been made in that estimate against this evil. The estimate has, therefore, been partially revised, and an additional amount of "corduroying" and ditching has been provided for, which will increase it about $6,000; the whole of which ($50,000) will be required to make a good road, passable at all seasons of the year, especially during the spring and fall months.

The whole amount expended on this work since the last annual report has been $22,266 68, leaving a balance of $2,641 08. The estimate in detail is attached.

The fact that this road is the *only* one connecting, through a dense and uninhabited forest, the head of navigation on the Mississippi with

Lake Superior, sufficiently demonstrates its importance both to the interests of the State and those of the government.

2. *Road from Fort Ripley, via Crow-wing river, to the main road leading to the Red River of the North.*—The route for this road was surveyed in 1857 under instructions from my predecessor, Captain Thom, who, in a special report to the War Department, dated January 25, 1858, submited the results of the examination, a map of the route, together with an estimate of the cost; but Congress failed to appropriate the funds necessary for its construction. All therefore that has been done has been to expend the balance of the appropriation on hand upon a portion of the "first section," which extends from Fort Ripley to the crossing of Crow-wing river, a distance of thirty-seven and one-half miles. The following extract from the report of the resident engineer in charge (Mr. George H. Belden) will show the amount of work done the present season:

"The amount of the appropriation unexpended at the date of the contract (April 13, 1858) was insufficient to complete this division to the crossing of the Crow-wing river, but it has been applied so as to make a continuous road from Fort Ripley for twenty-nine miles, leaving eight miles upon which no work has been done. On this twenty-nine miles the streams are all bridged, excepting the Mississippi at Crow Wing village, where there is a good ferry, and Gull river, about four miles above Crow Wing. The bridge across the Gull river is much needed, and the want of it is the only serious blemish to the road as far as built. The work has been clearing and grubbing, generally, through light pine woods and oak openings, for a width of eighteen feet, bridging the small streams, corduroying marshes, and ditching and grading in a few places subject to overflow; the work has been faithfully done by the contractor. * * *

"As far as the road is built it is a great improvement on the old trail, and a distance of seven miles is gained. On that part of the 'first division' of road not built there remains some 2,000 feet of corduroy (or ditching and embankment across swamps) and the bridge across Swan river, a small stream of fifty feet width.

"The very wet weather of July and August showed the necessity of more grading, ditching, corduroy, and culverts, on the 20th and 21st miles, and I think the road is far better than it would have been had the weather been more favorable for the workmen.

"Should there be additional appropriation made for the road at the next session of Congress, a small amount might be judiciously expended to advantage in putting additional covering on the corduroy and in ditching some rather low grounds on this first twenty-nine miles."

The amount of funds available for this road at the time I took charge of it was $5,315 35, which has been expended. There are no arrearages.

In the special communication of my predecessor above referred to, the survey and location of this road was reported to have been completed to within 43 miles of the point where the law directed that it should intersect the main road leading (from Sauk Rapids) to the Red River of the North, and a reconnaisance made of the remainder of the

route. By reference to the map accompanying that report it will be seen that Otter-tail lake is a point on the road as at present surveyed, whence the route diverges from a nearly western course, which it had followed from Crow Wing village, to a nearly northwestern course for a distance of 64 miles, in order to intersect the main Red River trail at the forks; the object of the road being, doubtless, to facilitate the intercourse between the navigable waters of the Mississippi and the settlements at and beyond Pembina. The recent establishment of the new military post of Fort Abercrombie, which lies directly west from Otter-tail lake, seems to call either for a change of the route from this latter point where the road diverges to the north, or for the construction of an independent branch or continuation of the road westward to Fort Abercrombie. This post lies on the Red river, in about latitude 46° 23′ 30″, that of Otter-tail lake being 46° 24′ 1″.—(See Owen's Geological Report, pp. 170, 175) The distance in a direct line between these points is about fifty-six miles; allowing for the necessary windings of the road, say sixty or sixty-five miles, so that the vicinity of Otter-tail lake, the point of divergence of the two routes, lies about midway between Fort Ripley and the terminus of both of them. The wording of the law authorizing the construction of the Red River road, is such that no change in the route from Otter-tail west, in the direction of Fort Abercrombie, can be made without a change in the law, which provides that the construction shall be "*on the road* from Fort Ripley, *via* Crow-wing river, to the point *where said road* intersects the main road leading to the Red River of the North." The "road" thus explicitly referred to is the old established eastern Pembina trail, which, from Otter-tail lake, runs north northwest instead of west towards Fort Abercrombie. In order, therefore, that the route should take the direction of this post, authority would have to be given by law for the requisite change, or, should the construction of the road as originally contemplated, towards Pembina, be deemed still advisable, a branch from Otter-tail west to Abercrombie will have to be specially provided for, so as to open a direct communication between that post and Fort Ripley.

The great importance, indeed the absolute necessity of this proposed branch, or, rather, extension, as a purely military road cannot but be evident.

Supplies arriving by steamboat at St. Paul (the head of navigation of the Mississippi) can now be transported over one of the best roads in the country to Fort Ripley, (121 miles,) whence the construction of this road with the branch proposed will open a communication equally good with the most advanced post on our northwestern frontier; the whole distance of land transportation being about 250 miles.

From Otter-tail westward the country is represented as quite favorable for the construction of a good road, about one-third of the distance being open prairie and no expensive bridges being required, with the exception of one over Otter-tail and one over Pelican river, neither of which will exceed 60 or 70 feet in length. The route at present pursued in the transportation of supplies and building material for the new post, is to ship them from St. Paul to Fort Ridgely, on the Minnesota or St. Peter's river, a distance by water of about 350

miles, whence they are carried on wagons a distance of 180 miles over a country destitute of roads, timber, or settlements. The distance from St. Paul *via* Fort Ridgely, *by land*, will not vary much from that under consideration; but the importance of a direct, rapid, and sure communication between Abercrombie and Fort Ripley and the dense settlements of the Mississippi valley, will commend itself to the consideration of the department.

Taking into view the commercial and other advantages contingent upon an easy and constant communication with our northern frontier, it is not recommended that any change should be made in the route of the Red river road beyond Otter-tail lake, as already established by law; but it is earnestly represented to the department that the extension of the road from the vicinity of that point to Fort Abercrombie, especially in the present unsettled state of our Indian relations in that quarter, is a question for grave consideration.

These two roads are, beyond question, those at this time the most important to the safety as well as to the commercial and agricultural interests of Minnesota. Their construction will open a good country for settlement around Otter-tail lake, represented as one of the most fertile and desirable in the State, whilst the bearing of the road toward Pembina, connecting as it will the head of navigation of the Mississippi with the vast area occupied by the vallies of the Red river, the Assiniboin, Sackatchawan, and the system of rivers which covers so large a portion of the British possessions north of us, should be by no means overlooked.

The estimate for this road, submitted by Captain Thom, based upon the reconnaissance and survey reported, amounted, exclusive of the amount on hand, to $35,439 45. The amount actually expended upon it for work done this season is $5,030 27, leaving $30,409 18 yet to be appropriated by Congress, according to that estimate. A careful revision of Capt. Thom's estimate, based upon more accurate information as to prices for labor and materials, has resulted in increasing the amount to $32,782 20, or say $32,800. For convenience, the estimate is divided into three separate sections.

1. From the 29th mile, the point at which the work terminated this season, to the 72d mile, the point in the vicinity of Otter-tail lake, at or near which the proposed branch would diverge to go to Fort Abercrombie, 43 miles, the estimate for which amounts to $17,930.

2. From the 72d mile to the 3d crossing of Otter-tail river, (95th mile,) the point at which the actual survey terminated, 23 miles in length. The estimate for this division amounts to $5,888.

3. From the 95th mile to the 138th mile, (forks of Red river road,) 43 miles. This division was not surveyed, but only reconnoitered, and the estimate is consequently somewhat more conjectural than of the other portions of the road. It amounts to $5,124.

Summary.

1st division, 43 miles	$17,930 00
2d division, 23 miles	5,888 00
3d division, 43 miles	5,124 00

For survey of 3d division, 43 miles, at $20	$860 00
Add for engineering, office and contingent expenses, 10 per cent, or	2,980 00
	32,782 00
Or say	32,800 00

As before stated, the length of the proposed extension will be from 60 to 65 miles. From all the information that can be procured as to the character of the country over which the road would pass, it is assumed that the first 40 miles will not differ materially from that through which the first or eastern division of the road has been partly constructed; the cost per mile, therefore, of that division has been taken as the estimated cost of this part of the extension proposed.

The ascertained cost of the first 29 miles, with the outside cutting, is $247 per mile. This for 40 miles would be	$9,880 00
The remaining 25 miles resemble in character the 2d and 3d divisions, and its cost per mile would be about the same, viz: $166. Then 25 miles, at $166, would be	4,150 00
Add for bridges over Pelican and Otter-tail rivers, say 70 feet each, at $30	4,200 00
Surveying, say 60 miles, at $20	1,200 00
Making the whole cost of the proposed extension to Fort Abercrombie	19,430 00
And the whole cost of a road connecting Forts Ripley and Abercrombie	37,360 00
Add 10 per cent. for engineering, office rent and contingent expenses	3,736 00
Total amount	41,096 00
Or say	41,100 00

In the above no estimate is submitted for bridges across the Mississip i river at the 8th mile, nor across Crow-wing at the 37½ mile, as ferries have been established at both places. Should they be required the estimate for their construction is as follows:

1. For bridge across the Mississippi, 270 feet long, at $30	$8,100 00
2. For bridge across Crow-wing river, 300 feet long, at $33⅓	10,000 00
For bridge trestle work across the low ground at latter stream	1,000 00
	19,100 00

The above estimate for bridges is that of my predecessor, and I see no reason to alter it.

The estimate in detail for the construction of this road (1st, 2d, and 3d divisions, Fort Ripley to the "Forks of trail") is attached.

3. *Road from Mendota to mouth of Big Sioux river.*—This road extends from Mendota, opposite Fort Snelling, southwestwardly through Minnesota and Iowa to the mouth of Big Sioux river, a distance by the original survey of Captain Reno (made in 1853) of 279 miles. The route was resurveyed under the orders of my predecessor, Captain Thom, as far as the 178th mile, (measured from the mouth of Big Sioux,) a distance of 101 miles, and constructed (owing to the small amount appropriated) in a manner "only to make that portion of the road barely practicable, by the construction of such bridges, culverts, corduroying, &c., as were most necessary." Captain Thom, however, did not recommend the expenditure of any more labor on this portion of the road, with the exception of the completion of some corduroying near Mankato.

A better knowledge of the country as it has become opened up by settlement leaves little doubt that a better and shorter route can be obtained between the point where the construction terminates and the mouth of the Big Sioux than that followed by the original exploration. I have therefore added a small item for the continuation of the survey previous to the final determination of the precise location of the road.

The following is the estimate submitted by Captain Thom in his last annual report, which is hereby renewed.

For grubbing, smoothing, and cleaning off road-bed, corduroying and culverts	$1,286 00
For 55,000 cubic yards of earthwork, (including ditching, excavation and embankment, and the necessary amount of haul) at a probable cost of 25 cents per cubic yard	13,750 00
For 59 bridges, having spans from 12 feet to 134 feet in length	17,505 00
For survey and location of 178 miles of road, at $20 per mile	3,560 00
Add 10 per cent for engineering, office and contingent expenses	3,610 00
	39,711 00
Or say	39,700 00

I am, colonel, very respectfully, your obedient servant,

HOWARD STANSBURY,
Captain Corps Topographical Engineers.

Colonel J. J. ABERT,
Chief Corps of Topographical Engineers, Washington, D. C.

Estimate of amount of work required to complete the road from Point Douglas to the mouth of the St. Louis river.

1. *Between Taylor's Falls and Grindstone river.*		
For grading various steep ravines and sand hills on line of road, (particularly a pine ridge 35 feet high on 104½ mile,) say	$700 00	
Rebuilding Snake River bridge 186 feet long, at $40, as per Captain Thoma's estimate	7,440 00	
		$8,140 00
2. *Grindstone river to 141st mile—34 miles.*		
Grubbing, &c., roadway 18 feet wide, (from 121st to 141st mile,) 42 31/100 acres, at $55	2,327 05	
Felling and removing trees 24 feet on each side of roadway, (from 108th to 141st mile,) 185 acres, at $35	6,475 00	
Earthwork, (excavation, embankment, ditching, and corduroy covering,) 10,713 cubic yards, at 25 cents	2,678 25	
Corduroying (between 121st and 141st miles) 200 rods lineal, at $3 60	720 00	
51 culverts, of spans from 4 to 15 feet, and at from $25 to $56 each	1,547 00	
6 small bridges, (between 110th and 121st miles,) 15 to 20 feet span, at $150 each	900 00	
Bridge over Deer creek, (on 109th mile,) 25 feet span	250 00	
3 large (truss) bridges, 70 feet span, *via* Grindstone, Willow, and Portage (or Moose) rivers, at $1,500 each	4,500 00	
		19,397 30
3. *141st mile to Twin Lakes—16 miles.*		
Felling and removing trees 24 feet on each side of roadway, 95 acres, at $40	3,800 00	
Earthwork, (excavation, &c.,) 10,241 cubic yards, at 25 cts	2,560 25	
Corduroying 138. 6 rods lineal, at $2 70 per rod	374 22	
19 culverts, of spans from 4 to 10 feet, and at $17 and $32 each	370 00	
Bridge over Black Hoof river, (truss,) 70 feet span	1,500 00	
		8,604 47
4. *Twin Lakes to Superior—21 miles.*		
Earthwork, (chiefly ditching and corduroy covering,) 31,854 cubic yards, at 25 cents	7,963 50	
Corduroying 338 rods lineal, at $2 70 per rod	912 60	
Timber, (for repairs of burned bridges,) 5,575 feet, superficial, at 8 cents	446 00	
		9,322 10
Total amount		45,463 87
Add 10 per cent. for engineering, office and contingent expenses		4,546 38
		50,010 25
Say		$50,000 00

Estimate of amount of work required to complete the road from Fort Ripley, via Crow Wing river, to the main road leading to the Red River of the North.

		Amount.	Total.
1. *29th mile to 72d mile, equal 43 miles.*			
Grubbing, &c., roadway, 18 feet wide, 47 acres, at $50		$2,350 00	
Felling and removing trees, 24 feet each side roadway, (72 miles,) 260 acres at $20		5,200 00	
Earthwork, (excavation, &c.,) 10,260 cubic yards, at 25 cents		2,565 00	
Corduroying 513 rods lineal, at $3		1,539 00	
Fourteen culverts, at $30 each		420 00	
6 small bridges, 20 feet span, at $190 each	$1,140		
2 small bridges, 25 feet span, at $224 each	448		
2 small bridges, 30 feet span, at $269 each	538		
Bridge over Wing river, 40 feet span	330		
Bridge over Leaf river, 60 feet span	900		
Bridge over Gull river, 120 feet span	2,500		
		5,856 00	
			$17,930 00
2. *72d mile to 95th mile, equal 23 miles.*			
Grubbing, &c., roadway, 18 feet wide, 12 acres, at $50		600 00	
Felling and removing trees, 24 feet on each side of roadway, 30 acres, at $20		600 00	
Earthwork, (ditching, &c.,) 1,200 cubic yards, at 25 cents		300 00	
Corduroying 66 rods lineal, at $3 per rod		198 00	
1 small bridge, 20 feet span	$190		
Bridge over 1st crossing, Otter Tail river, 100 feet span	2,000		
Do....2d.....do.....do	2,000		
		4,190 00	
			5,888 00
3. *95th mile to 138th mile, equal 43 miles.*			
Grubbing, &c., roadway, 18 feet wide, 23 acres, at $50		1,150 00	
Felling and removing trees, 24 feet each side of roadway, 60 acres, at $20		1,200 00	
Earthwork, (excavation, &c.,) 2,400 cubic yards, at 25 cents		600 00	
Corduroying 115 rods, lineal, at $3		345 00	
3 culverts, at $30 each		90 00	
3 small bridges, of 20 feet span, at $190	$570		
.....do.....30.....do	269		
Bridge over 3d crossing Otter Tail river, 60 feet span	900		
		1,739 00	
Survey and location of this portion of road, 43 miles, at $20		860 00	
			5,984 00
Total amount			29,802 00
Add 10 per cent. for engineering, office and contingent expenses			2,980 20
			32,782 20
Or say			$32,800 00

APPENDIX E.

WASHINGTON, D. C., *October* 19, 1858.

SIR: While engaged in the field, in the summer of 1851, directing the surveys and investigations called for by the appropriation act for the survey of the delta of the Mississippi, I was suddenly prostrated by sickness, which obliged me to relinquish the charge of that work. Subsequently the duties assigned me in the War Department absorbed all my time, and it was not until the fall of 1857 that I was enabled to resume the active prosecution of the work.

After having ascertained, by a careful examination of the records of the survey, what further observations, measurements, and surveys were necessary, authority was asked and obtained from the Topographical Bureau to resume field work.

Lieutenant Henry L. Abbot, Topographical Engineers, who had been ordered to report to me for duty upon this survey, was then directed to proceed to the Mississippi river, organize the necessary parties, and collect the required data. The following synopsis will give an idea of the most important operations:

1. Gauge rods were established at the following localities, viz: Columbus, Kentucky; Memphis, Tennessee; Napoleon, Arkansas; Vicksburg, Mississippi; Natchez, Mississippi; Red River Landing, Louisiana, and Carrollton, Louisiana.

Gentlemen were employed at each of these localities to observe daily and record the height of the water upon the rod, the state of the weather, the direction of the wind, &c., &c.

2. Accurate measurements and soundings of the high water cross sections of the Mississippi were made at the following localities, viz: Columbus, Kentucky; New Madrid, Arkansas; a point two miles above Osceola, Arkansas; Randolph, Tennessee; Helena, Arkansas; Napoleon, Arkansas; Lake Providence, Louisiana; Vicksburg, Mississippi; New Carthage, Louisiana; Natchez, Mississippi; Baton Rouge, Louisiana; Bonnet Carré, Louisiana, and Fort St. Philip.

3. Accurate cross sections and corresponding measurements of velocity necessary to determine approximately the discharge of the following tributary streams were made, viz: Ohio river, Hatchee river, St. Francis river, White river, Arkansas river, the cut-off between the Arkansas and White rivers, Yazoo river, Red river, Black river, Atchafalaya river, and Old river above Red River Landing. Similar observations were also made at Berwick's bay, Louisiana.

4. Parties were established at two stations to measure daily, with the greatest care, the velocity of the current in all parts of the river section, and thus obtain the data necessary to determine accurately the discharge at these stations.

The first of these parties was located at Columbus, Kentucky. It was placed in charge of Mr. Henry C. Fillebrown, civil engineer, assisted, first, by Mr. W. E. Webster, and subsequently by Mr. C. L. Jones. The second party was located at first at Natchez, Mississippi, under the charge of Lieutenant H. S. Putnam, Topographical Engineers, assisted by Mr. J. T Champneys, civil engineer. It was subsequently moved to Vicksburg, Mississippi, and placed in charge of

Mr. Holmes A. Pattison, Lieutenant Putnam having been ordered on duty with the army in Utah.

Similar, but much less elaborate, measurements of the daily discharge of the Arkansas river at Napoleon were placed in charge of Mr. Alfred A. Edington. The labors of these parties have extended through the entire flood of this year, and have not yet terminated. Great commendation is due to the gentlemen engaged upon them for their faithful and uninterrupted exertions during a season remarkable for its intense heat and sickly character.

5. A party was organized and placed in charge of Mr. Wm. Sidney Smith, civil engineer, with instructions, after the flood had partially subsided, to pass down the river from Cairo to Memphis, in a yawl, measuring the dimensions of the various crevasses, and collecting all the information regarding the date of occurrence, rate of increase, &c., which could be obtained from reliable sources. At the last report of Mr. Smith he had nearly completed his work, in a highly satisfactory manner.

6. The width of the Mississippi was measured at many places, several short lines of level were run for especial purposes, the velocities of the Bell and La Branche crevasses were measured, and much other similar work performed.

7. Great care was taken to collect correct information, from every available source, upon the following subjects, viz: the height and date of the different high waters at every point visited from Cairo to the Gulf; the extent of the levees before the flood of this year, their dimensions, &c., between these termini; the depth of overflow in the various swamps bordering the river, the nature of their growth and their geological character; the seasons of the floods, the range, &c., &c., of the tributary streams below Cairo, &c., &c.

8. A party has been organized and placed in charge of Mr. Holmes A. Pattison to make a chain and level survey from the high lands east of the great Yazoo Bottom, via Greenwood and McNubb, to Prentiss, on the Mississippi river. It is hoped by this survey, checked by other methods, to form an approximate estimate of the average depth of overflow through this swamp. Mr. Pattison is also charged with a similar work from Vidalia to Harrisonburg, with certain measurements upon Bayous Plaquemine and La Fourche, to determine what changes, if any, have taken place since the former field work of the survey in 1851. He will also re-sound the old lines above and below the great Bonnet Carré crevasse of 1850, to determine if any change has occured in the bottom of the river since 1851.

9. Profiles of the railroad routes which cross the overflowed lands of the Mississippi valley have been obtained from the officers of the companies, and lines of level from the office of the swamp land commissioners in Baton Rouge. From these and other sources many accurate cross sections of the delta formation have been obtained, and it is thought that sufficient data have been, or soon will be, collected to form an approximate estimate of the average depth of the water in these swamps before levees were constructed.

The great amount of work done and information collected since the resumption of field duties are due to the intelligent and energetic labors of Lieutenant Abbot.

It may be proper in this connexion to state briefly the nature and extent of the data collected previous to the resumption of the survey.

It comprised a topographical survey, including the running of a line of levels on each bank of the Mississippi, from the mouth of Red river to Carrollton. From this point to the mouth of the river surveys had been previously made by the War Department. Cross lines of level were made at various places, and surveys carried for some distance down the Bayous Plaquemine and La Fourche and across to Lakes Ponchartrain and Borgne.

Hydrographical cross sections of the river, with observations for velocity, were made at various points from the mouth of Red river to New Orleans. Similar sections and observations were taken of all the bayous leading from the river between these two points, and of Berwick's bay and of the bayous in that vicinity.

Gauge rods were established at Lake Providence, New Carthage, Natchez, the mouth of Red river, Baton Rouge, Donaldsonville, Carrollton, and Fort St. Philip; gauges were also established in Lake Pontchartrain, Lake Borgne, and a bayou opening into the Gulf, near Fort St. Philip. These gauges were connected with those of the river by lines of level. Temporary gauges were also established at Berwick's bay, Indian Village, &c.

A general examination of the bayous, streams, and lakes comprised in the delta below Red river was made, and several cross sections of the delta formation, from its head to below New Orleans, were obtained.

Information respecting the rise and fall of the Mississippi river from St. Louis to the Balize, the height and duration of the floods, and the extent and depth of overflow on the delta formation was gathered, and similar inquiries extended to its tributaries.

Cross sections of the river were made with the greatest care at Carrollton, and an extensive series of observations carried on for discharge, and for quantity of earthy matter held in suspension.

The discharge of all the crevasses that occurred below Red river during 1851 was measured, and all the information respecting those of previous years was collected.

Certain soundings, measurements, and investigations were made at the mouth of the river, but the accurate survey of the delta proper from below Fort St. Philip, by Captain Talcot, of the Corps of Engineers, which included elaborate velocity observations, together with the resurvey of the mouths by the Coast Survey, rendered detailed work there unnecessary.

The resumption of field-work at this time has been singularly fortunate. The flood of this year is the first which has occurred since the field-work of the survey in 1851, and observations like those undertaken this year would have been of comparatively little value before this season. The parties were all organized, the river gauges erected, &c., &c., before the river began to rise last winter, and all the phenomena of the high water of this year have been accurately observed in a manner which, together with the other information collected, and the results of the former examinations, investigations, and surveys, cannot fail to supply the data required to solve all the problems connected with the subject of protection from inundation—problems

which can only be solved by investigations as extended and elaborate as those enumerated.

The field-work of the survey will soon be finished.

The office-work is being pressed forward with all possible despatch, and the report will be submitted at as early a day as practicable.

Very respectfully, your obedient servant,

A. A. HUMPHREYS,
Captain Topographical Engineers.

Colonel J. J. ABERT,
Chief of the Corps of Topographical Engineers.

APPENDIX F.

MILITARY DEPARTMENT OF NEW MEXICO,
Santa Fé, September 29, 1858.

COLONEL: For the information of the Bureau of Topographical Engineers I have the honor to submit to you a report of the operations during the past year upon the five military roads in my charge in the department of New Mexico.

I.—*Road from Fort Union to Santa Fé.*

The operations upon this road were begun in the month of March and continued until the end of August, by which time the appropriation was so nearly exhausted that it was deemed advisable to discontinue the work, with a view of ascertaining the exact amount of money remaining applicable to this road. This I was enabled to do without loss on any side, as I placed the working party at once upon an adjoining road where I had just made arrangements to begin work. There has been expended upon the road labor amounting to 10,499½ days' work of foreman, mechanics, and laborers, and 131 days' use of teams, and, as a result, two of the most formidable obstacles upon the route have been overcome, viz: the rocky hill near Tecalote and the rough and dangerous route through the Apache cañon. The former of these, being a ridge of stratified sandstone, could only be crossed with comfort by macadamizing about half a mile of the roadway over it; and the latter involved a great expense of masonry and blasting to make the road, of thirty-three feet in width, in a secure location and guard it against encroachments from the mountain torrent, which at times rushes along the arroyo winding through the cañon. This arroyo it was found necessary to cross at one point by a small but very strong bridge, of eighteen feet span, and a width of twenty feet for the roadway over it. The bridge has stone abutments of dry masonry, and the superstructure is made of hewn pine timbers of excellent quality. The above work is all in use, having been thrown open as successive portions of it were completed. In addition to the above, the new route across a mountain spur between "Rock Corral" and Apache

cañon has had a large amount of work applied to it, and it is hoped will be opened for travel with what remains of the appropriation. A portion of this section has been in use three months. This road affords the communication between Fort Union and the headquarters of the military department of New Mexico, and is also used as the best route at present between Fort Union and the principal depot at Albuquerque. It crosses the great southern branch of the Rocky mountain range at the most northerly point practicable for an easy wagon road, and is a portion of the great mail route between the old States of the Union and the largest settlement of New Mexico; it is, in short, the principal entrance to the heart of this Territory. For these reasons it is hoped that the estimate herewith submitted for perfecting the road may meet with favorable consideration. It is the same estimate which was laid before the bureau at the commencement of the operations, and its accuracy is well established by the work already done.

II.—*Road from Tecalote to Albuquerque.*

This road is intended to afford an easier route between the eastern border of the Territory and the military depot at Albuquerque, and an appropriation of $10,000 was made to improve it, *via* Cañon Carnuel and Cañon Blanco. This amount, though it will pay for very important improvements in the two cañons above named, is not sufficient for perfecting and securing the requisite work in Cañon Carnuel alone; and besides the two cañons named in the act authorizing the improvement of this route there is another point of great difficulty on the shortest route between Tecalote and Albuquerque which should also be improved, viz: the descent from the great mesa, east of the Sandia mountain, into the valley of the Pecos, which river should be crossed by this road at or near San Miguel. For this reason I have presented a new estimate for this road, which I hope may be approved.

Cañon Carnuel is the pass through the lofty range of mountains running parallel to the Rio del Norte and about ten or twelve miles east of that river. This cañon is much the more formidable obstacle of the two above named. It is necessary to pass through it on the route between Albuquerque and Fort Stanton, and in getting the supplies of timber and fuel for the military depot at Albuquerque. I have therefore determined to commence these improvements in that cañon. The work was begun here in the month of April and will be continued at least through September, perhaps longer, if the funds will justify it, having, of course, a due regard to the improvement of Cañon Blanco.

At the end of August there had been expended upon this route 4,179¼ days' work of foreman, mechanics, and laborers, and 124 days' use of teams, and for a result there is a new road made, which affords an easier descent from the mouth of the cañon to the Albuquerque plain, and within the cañon many of the greatest difficulties have been removed, and the road rendered comparatively safe; still much remains to be done to make a good and permanent road through the cañon.

III.—*Road from Cañada to Abequea.*

A small appropriation was made for the improvement of the above

named route. Abequea is situated in the mountain region, on the right bank of the Chama river, about twenty-two miles from its mouth, which is on the west side of the Rio del Norte, opposite to the town of Cañada. This road derives its military importance from the fact that Abequea was formerly garrisoned by our troops and is likely to be again occupied, as it is one of the avenues by which to enter the Navajo country. A certain degree of importance and interest must also be attached to it as the eastern terminus of the "old Spanish trail."

This road is very sandy and consequently very difficult for the passage of wagons; it has, however, two obstacles of another character upon it, viz: the rocky ridge which projects to the river at a point called Cuchillo, and the hill at Abequea. The operations for the improvement of the road have been commenced at the former of these points, where a good road will soon be made by cutting down the rocky hill and making a passage of proper width where there was formerly but a single wagon track of a very rough and dangerous character.

At the end of August there had been bestowed upon this work 1,138 days' work of foreman, mechanics, and laborers, and 13 days' use of teams.

As the appropriation of $6,000, originally made for this road, will probably be sufficient for overcoming the two obstacles to safe travel named above, no new appropriation is asked for.

IV.—*Road from Taos to Santa Fé.*

This road is one of very great interest and importance, whether considered in a commercial or military light, as the means of affording an easy outlet for the abundant products of the rich and justly celebrated valley of Taos, or as the route of communication between the headquarters of the department and the upper posts of the valley of the Rio del Norte.

The chief obstacle to the easy construction of a road between Taos and Santa Fé is the mountainous formation which extends westwardly from the great southern branch of the Rocky mountain range, in the vicinity of the Moro Peaks, and crosses the Rio del Norte, constituting a formidable natural barrier between the valley of Taos and the country around Santa Fé. At present wagons pass with great difficulty over the route by the eastern part of this barrier; but the road is very circuitous and rough, crossing mountain streams and immense stony hills and being in many places annually encroached upon by deep arroyos. To improve this route, and make the grades easy enough for loaded wagons, would considerably increase its present length; and the great expense which it would cause could produce no lasting benefit, owing to the exposure of the work to destruction from the mountain torrents in the rainy season.

Between the above route and the Rio del Norte there is a bridle path which passes in a direct course through El Embudo, but it is so steep that in wet weather animals pass over it with difficulty. The heavy grade and mobile character of the soil throw it out of consideration as a wagon road route.

The route to which I give the preference, after a careful examination of all of them, is as follows:

From Taos, in a southwestwardly direction for about 18 miles, to a point on the Rio del Norte called "Sienaguilla;" thence through the cañon of the Rio del Norte, by cutting a roadway into the slope of the left bank, 15 miles to La Joya; and thence by the road common to all the routes above named, 40 miles, to Santa Fé; being in all 73 miles, and 14 miles shorter than the present difficult and objectionable wagon road. The greater part of the first section above named is over easy ground, requiring scarcely any work to make a perfect road; but on approaching Sienaguilla there will be some heavy work for about 3 miles, involving the crossing of two deep arroyos and the easing of three very considerable hills.

From Sienaguilla to La Joya, for 15 miles, involving the removal of broken rock and the cutting of the roadway into the side slope of the mountain, and constituting the expensive feature of the road, but offering a grade which is scarcely a perceptible departure from the true level, and affording the only chance for a permanent roadway to pass the mountains.

The remaining section of forty miles requires considerable work at certain points, such as a new location near Pojoaque, to avoid arroyos and to be protected against their encroachments, and also a new location, involving much cutting and grading, along Jesuque creek, and among the sand hills just north of Santa Fé.

The accompanying estimate shows the probable cost of effecting this great work, and it is hoped that the importance of the route will lead to its favorable consideration.

V.—*Road from Santa Fé to Doña Ana.*

The small balance of appropriation which came into my hands for this long route was, at my recommendation, made applicable to that section of the road between Santa Fé and Albuquerque, and a party has been set at work upon the somewhat difficult descent into the valley of the Galisteo, as being the point where most good can be done with the means available. This route is an important one as it constitutes the line of communication between the headquarters of the department of Santa Fé and the military posts down the Rio del Norte, and also, in part, between these posts and those east and west of that river in New Mexico. The sum originally appropriated, of twelve thousand dollars, for the improvement of this road was entirely too small to make a good and permanent communication throughout this long line of some three hundred miles, nor perhaps was such a result contemplated, but merely the removal of serious obstacles to easy and safe travelling, so as to place the road within the possibility of being kept in repair or in passable condition by the neighborhood work, which should be applied to it by the county authorities; indeed, in all these works I have thus far been governed by the consideration of bringing each road to a state of repair that would place it for the future within the scope of the county or neighborhood work, and with this view I have submitted an estimate for continuing the improvement of the road from Santa Fé to Doña Ana, and which I hope will be favorably considered from the great importance of the route which constitutes the principal part of the north and south line of communication through the Territory.

In the prosecution of these duties I have had the good fortune to be most ably assisted by Joab Houghton, esq., whose long residence and high position in this Territory have given him a knowledge of the country, and of the people, and their language, which has proved to be of the utmost value to the interests of the works, and which, I regret to say, has been but inadequately repaid by the moderate compensation which the smallness of the appropriations compels me to fix upon.

All of which is respecfully submitted by your most obedient servant,

J. N. MACOMB,
Captain Topographical Engineers.

Colonel J. J. ABERT, *Com'g Corps Top. Eng'rs.*
United States Army, Washington, D. C.

Estimates for the roads in New Mexico, in charge of Captain J. N. Macomb, Topographical Engineers.

I.—ESTIMATE FOR THE COMPLETION OF THE ROAD FROM FORT UNION TO SANTA FÉ.

From Santa Fé to the Arroyo Hondo, 5 miles and 3 chains	$1,500 00
From Arroyo Hondo to Rock Corral, 4 miles and 26 chains	4,500 00
From Rock Corral to Apache cañon, by present main road, 4 miles and 59 chains; but by trail, which can be improved, 2 miles and 39 chains	8,500 00
From the mouth of Apache cañon to El Arroyo de Pecos, by present road, 10 miles and 73 chains; but by trail, which can be improved, 9 miles and 64 chains	10,500 00
From El Arroyo de Pecos to San José, crossing of Pecos river, 18½ miles	7,500 00
From San José to Tecalote, 15½ miles	6,500 00
From Tecalote to Las Vegas, 11 miles	3,500 00
From Las Vegas to Fort Union, by one road, 30 miles, by another, 27 miles	4,500 00
Bridges across the rivers Pecos, Moro, Sapella, and Gallenas, at $1,000 each	4,000 00
Total	51,000 00
From which deduct amount appropriated for this road by act of March 3, 1855, No. 58, chapter CLXIX	16,000 00
Total required for the completion of the road from Fort Union to Santa Fé	35,000 00

II.—ESTIMATE FOR COMPLETING THE ROAD FROM TECALOTE TO ALBUQUERQUE.

From Albuquerque to Tejares, through the Cañon Carnuel, 18 miles	$8,000 00
From Tejares to Carpenter's rancho, 6½ miles	2,000 00
From Carpenter's rancho to Cañon Blanco, 75 miles	5,000 00

From Cañon Blanco to San Miguel, descending from the Mesa at or near Puerte Capote, 30 miles	$8,000 00
From San Miguel to Tecalote, 15 miles	2,500 00
Bridge over Pecos river	1,000 00
	26,500 00
From which deduct balance of former appropriation on hand at the time of making this estimate.—(See act of March 3, 1855, No 58, chapter CLXIX.)	3,500 00
Total required for the completion of the road from Tecalote to Albuquerque	23,000 00

III.—ROAD FROM CAÑADA TO ABEQUEA.

No further appropriation is asked for on account of this road at this time.

IV.—ESTIMATE FOR COMPLETING THE ROAD FROM TAOS TO SANTA FÉ.

Section from Taos to Sienaguilla, 18 miles	$13,500 00
Sienaguilla to La Joya, through the cañon of the Rio del Norte, 15 miles	82,500 00
From La Joya to Santa Fé, 40 miles	21,500 00
	117,500 00
From which deduct the balance on hand of appropriation made by act of July 17, 1854	4,500 00
Leaving total required for the completion of a road from Taos to Santa Fé	113,000 00

V.—Estimate for continuing the improvement of the road from Santa Fé to Doña Ana, and for surveying the route thereof, with a view of making the final location of that portion between Albuquerque and Doña Ana, $25,000 00.

All of which is respectfully submitted by your most obedient servant,

J. N. MACOMB,
Captain Topographical Engineers.

SEPTEMBER 29, 1858.

Colonel J. J. ABERT,
Commanding Corps Topographical Engineers, U. S. A.,
Washington, D. C.

APPENDIX G.

OFFICE MILITARY ROADS PACIFIC COAST,
San Francisco, California, September 25, 1858.

COLONEL: In submitting to your bureau a report of operations during the past year on the several military roads now under my charge, I beg leave to refer you to the accompanying report of Lieu-

tenant G. N. Mendell, Corps of Topographical Engineers, made to me by direction of Major Bache, Corps of Topographical Engineers, on turning over to me the charge of the same.

The necessity for examining the location of the military road from Astoria to Salem, O. T., with a view to its improvement, will prevent the further construction of any portion of this road before the close of the present season, under the appropriation of $30,000 made therefor by Congress at its recent session. The additional amounts named by Lieutenant Mendell, as necessary for the completion of the other roads, I have the honor to recommend to the favorable consideration of the department.

The following statement exhibits the funds pertaining to the several roads on hand the 16th instant; also, the amounts estimated as requisite for their completion, viz:

	Amount of funds on hand September 16.	Amount requisite for completion.
1. Road from Myrtle creek to Camp Stewart, O. T.	$15,653 22	$10,000 00
2. Road from Myrtle creek to Scottsburg, O. T.	19,302 40	----------
3. Road from Astoria to Salem, O. T.	*31,988 50	----------
4. Road from Vancouver, W. T., to the Dalles, O. T.	34 73	----------
5. Road from Vancouver to Steilacoom, W. T.	4,575 58	50,000 00
6. Road from Steilacoom to Bellingham bay, W. T.	8,534 12	40,000 00

* On hand September 1.

I am, Colonel, very respectfully, your obedient servant,

GEO. THOM,
Capt. Topographical Engineers.

Colonel J. J. ABERT,
Chief Corps of Top. Engineers, Washington, D. C.

PORTLAND, O. T., *September* 16, 1858.

CAPTAIN: By direction of Major Bache, Corps of Topographical Engineers, I make to you the following report of operations on the military roads in Oregon and Washington Territories since the date of my last annual report.

I.—ROADS IN SOUTHERN OREGON.

1. Road from Camp Stewart to Myrtle creek:

Amount of original appropriation	$30,000 00
Balance on hand	15,653 22
Amount expended	14,346 78

2. Road from Myrtle creek to Scottsburg:

Amount of original appropriation	$30,000 00
Balance on hand	19,302 40
Amount expended	10,697 60

These roads are a continuation of each other. From Scottsburg to Myrtle creek is about 65 miles, from Myrtle creek to Camp Stewart is about 95 miles.

In accordance with instructions from proper authority I left San Francisco on the 10th of March ultimo, to make an examination of these roads, and upon my return rendered a report as to the proper method of disbursement.

Appropriations were made some years since for both of these roads, and the road first named was located and partially constructed in 1853, and the other during the following season. The work requisite to be done being chiefly that of repair, and difficult to be described accurately, it was determined to prosecute it mainly by hired labor, giving contracts for the bridges and for a portion of the road which it would have been difficult to supervise carefully. Accordingly a party of laborers for each road was organized in San Francisco and despatched to the Umpqua by the steamer of April 6, both parties being under the direction of Colonel Jos. Hooker.

The party for the first named road proceeded to the cañon, about 75 miles from Scottsburg, and commenced work immediately, and has progressed favorably since, with a force varying between twenty and forty men.

This cañon is the artery of travel between the northern and southern portions of the coast. It is about 11 miles in length and has always presented the greatest difficulties. For wagons it has been almost impracticable, and for horsemen it has been by no means favorable. The principal features of difficulty have been the portion, about one mile in length, where the walls of the cañon become almost vertical, and the southern end, some four miles in length, where the mud has collected to great depths. On the former portion the road was previously located in the creek, and was but a succession of small precipices and huge boulders. Where the creek attained its height it was entirely impracticable. The line was re-located and placed on the side of the mountain. This has involved a great expense, as the road has been literally blasted out of the hard basaltic rock. The improvement, however, is of the most permanent character, and perhaps at no point in the country would the application of the same amount of money have been of more advantage to the public than in this instance. Improvements are now progressing on the southern end with a large force, with the intention to complete it before the arrival of the rainy season. Much of this mud is due to the entire lack of drainage, which will be remedied by the construction of frequent drains and culverts, while other portions will be bridged. It was estimated that $18,000 or $20,000 would make an excellent road through this cañon, and $8,000 have been appropriated to a section of 13 miles, lying south of the cañon and including the Grace Creek hills.

The character of road is 16 feet in width, free from roots and stumps, the timber cut down to widths varying from 30 to 60 feet. The width is reduced where there is heavy rock or earth excavation, but in all places it will be easily practicable for a 6-mule team.

On this road the following contracts have been entered into, viz:

1. Hardy and Thomas Elliff, amount $8,000; object, the thorough

repair of 13 miles of the road, commencing at Cow creek and extending towards Jacksonville.

2. Messrs. Ransom & Roberts, for the erection of 3 bridges, of lengths as follows, viz: 1st, 75 feet; 2d, 150 feet; 3d, 130 feet at, rates as follows: 1st bridge, $300; 2d, $400; 3d, $600; the privilege being reserved in the last two cases to increase the lengths of the bridges by paying $2 50 for each additional foot lengthened.

Messrs. Elliff were, on August 1st, ultimo, progressing rapidly in their repairs, and doubtless they are now prepared to have their work examined.

Messrs. Ransom & Roberts have already completed the first bridge described, and on August 1 were progressing rapidly with the others.

Agreements have, in addition to those mentioned, been entered into by the agent, for the erection of other small bridges in the cañon at reasonable rates.

An additional appropriation of $10,000 is very much needed to complete on the same scale the whole line. Immediately north of the cañon there is an interval of two miles where high cliffs abut against the stream, and which in high water is impassable. This corrected, and the main route to California will be a most excellent road. If it is not built by the government it is probable that it will remain in its present state for many years to come.

On the Scottsburg and Myrtle Creek military road the laboring party, averaging probably about 20 men, has been engaged in general repairs, and has made an excellent road for about 15 miles, including several excellent bridges of considerable lengths. On August 1 the bulk of the laborers left the work, owing to the excitement of the Frazer river mines, and for some time it was impossible to replace them. The reaction has, however, occurred, and two additional parties have been employed—one near Roseburg, and one at Myrtle creek. Under these arrangements it is expected that almost all the necessary repairs will be completed by the close of this season.

The following contracts have been made on account of this road, viz:

With A. B. and L. L. Kellogg for the construction of several bridges of the most substantial character, the aggregate length being 316 feet, at $4 per foot; also, for the thorough repair of another bridge, 126 feet in length, at $2 50 per foot.

2. With R. M. Hutchinson for a bridge over Deer creek, at Roseburg, of 175 feet in lengh, more or less.

3. With Hill & Co. for a bridge over the Kansas swale, 220 feet in length.

Most of these bridges have been constructed. Some have been paid for, and all will, without reasonable doubt, be ready for inspection upon the next visit of the officer in charge.

It has been the aim on these roads to make the improvements of the most permanent character, and to improve those points which the sparse population would have been unable to accomplish for years to come. The ordinary repairs and police of the roads have, in a measure, been passed by. No work has been done on the last mentioned road on the interval between the ferries.

II.—ASTORIA AND SALEM MILITARY ROAD.

At the date of the last annual report there remained unopened 16 miles of this road. This was completed in October, and since that time no work has been done upon it.

It is suggested that new examinations be made of the country, in order to improve the location, in case further disbursements are made upon this road.

III.—ROADS IN WASHINGTON TERRITORY.

1. *Vancouver and Steilacoom Military Road.*

Since my last annual report Mr. Tower, the contractor, has completed the work required to be done under his two contracts, viz: The construction of about 33 miles of road. This work was accepted on the 10th instant, though the time for its completion was last fall. Exceptions were taken to it when it was first reported for inspection, and Mr. Tower was required to correct the defects.

Early in the last spring the location of this road was continued down the west bank of the Cowlitz to Monticello; and, in pursuance to a call for bids, contracts were made with Geo. Drew and William Jackson for the construction of 17 miles of the continuation, which about exhausts the balance on hand. Mr. Drew constructs about 7 miles of the road, Mr. Jackson about 10.

It is to be regretted that the additional appropriation of $15,000, asked for in the last annual report, was not available last spring for application to this portion. It would have enabled the selection of a route where the grades could have been made much easier, while in its absence it was proper to open as much of the line as was possible with the means on hand. A junction with the old trail, eleven miles above Monticello, has been effected, thus opening a route for travel along the west bank of the Cowlitz. The heavy grades on this line, while they will by no means preclude its use as a wagon road, will probably prevent its even being used extensively for freighting. These contracts of Messrs. Drew & Jackson are almost completed, and the road is now practicable throughout Eleven miles of the line above Monticello remain untouched, and an additional appropriation of $10,000 will be requisite for this purpose. To open the line from the Cowlitz to Vancouver another addition of $40,000 will be necessary, making in all $50,000.

2. *Steilacoom and Bellingham bay Military Road.*

The reconnaissance of this route was completed on November 21, ultimo. Mr. W. W. de Lacy was engaged during the winter upon the maps and memoir. Early in the spring a call was made for bids for the construction of portions of the route, and subsequently a contract was made with Vaughn & Lowell for the completion of the portion between the Puyallup river and Seattle, a distance of about 27 miles. This contract failed to meet the approval of the Secretary of War, and was accordingly annulled. The contractors, previous to the receipt of this notification, had completed 20¼ miles, leaving an interval of eight miles south of Seattle unimproved.

A contract was also made with Fitzhugh & Warbass for the con-

struction of about 5½ miles of road at Bellingham bay, as well as for the erection of several bridges of considerable lengths. This they have completed and payment in full has been made to them.

A bid was made for a trail from Seattle to Whatcom, but as the balance on hand would not have been sufficient to open the line throughout at the rate proposed, the bid was not accepted.

There have been completed nearly 27 miles of this road and several hundred feet of most excellent bridging.

Amount of original appropriation	$35,000 00
Balance on hand	8,534 12
Expended	26,465 88

For the completion of this road an additional appropriation of $40,000 will be necessary.

Further information on these roads will be found in my monthly reports during the past year.

Very respectfully, your obedient servant,

G. H. MENDELL,
1st Lieut. Top. Engineers.

Captain GEORGE THOM,
Corps of Top. Engineers, San Francisco, Cal.

SIR: Having been appointed by you to make a reconnaissance of, and locate the line of, a military road from Steilacoom to Bellingham bay, and having accomplished that duty, I beg leave respectfully to make the following report:

My reconnaissance was to commence at the Puyallup, where the lower road to Muckleshoot prairie crosses at Carson's, about seven miles above the mouth of the river. Of the interior of the country before me but little was known beyond Seattle.

My party consisted, besides myself, of three white men, and five Indians as packers. At Seattle I hired a canoe and Indian crew to furnish me with supplies along the coast, and placed it in charge of a reliable white man.

I started from Fort Steilacoom with my party on the 11th August, and reached the Puyallup the next day. From this point my reconnaissance was to be directed, according to my orders, to find a line as near the coast of the Sound as the formation of the country would permit. In this object I was successful. I pushed through as rapidly as the dense forest and a due attention to the attainment of my object (to obtain a knowledge of the country) would permit, procuring Indian guides whenever practicable, and making a random line to serve as a guide on my return, and arrived at Bellingham bay on the 20th September. After having spent a few days in recruiting the party and preparing a rough report, maps, and estimates for your information, I started on my return.

The line was, in general, located near the guide line, but was much shortened and improved, and was completed on the 21st November, on which day I arrived at Fort Steilacoom, and discharged my party.

The weather during the whole of the return trip was rainy and inclement.

The road is naturally divided into five sections by the Dwamish, Snohomish, Stilagaumish, and Skagit rivers, which debouch into the Sound.

As each section has its characteristics, I shall proceed to describe them separately, giving the estimated length, general course, topography, and estimated cost, &c.

The line was run with a pocket compass, and the distances estimated. Between the Snohomish and Seattle the line was connected with the meridian line of the public surveys, and all the courses corrected for the amount of error found.

FIRST SECTION.

Between the Puyallup and Dwamish rivers, length, 19 miles; general course N. 2½° E.

The ridge, or rather plateau, between these rivers, and which separates the waters of White river from the Sound, is about 200 feet high, and has an average breadth of about 4 miles. Its surface is covered by lakes and swamps, some of which are nearly a mile in length. These form numerous basins, between which the ground is undulating and sometimes a little rough. None of these lakes or swamps, as far as observed, had any outlets either to White river or the Sound. A few small streams take their rise in this ridge, and flow into White river and the Dwamish. The bluff on every side descends to the river bottoms in benches, an arrangement which much facilitates the ascent of the road to the summit.

The road crosses the Puyallup river about 150 yards below Carson's blockhouse, and, passing through the river bottoms for about 400 yards, ascends the bluff, where it is intersected by a ravine. At this point the bluff is divided into two benches. The height of the first will be about one hundred, and of the second, eighty feet, with an interval between them of perhaps 400 yards. From the foot to the summit of the bluff will be about half a mile. The ravine affords the means of reaching the first bench without a very difficult slope, say 1 in 5; and the second is still less difficult. The whole distance to the summit, however, will have to be graded.

Having reached the summit, the line proceeds in a nearly due north direction for 12 miles, until it strikes the county road to White river bottom, near the eastern edge of the bluff. The line winds a little occasionally to pass between the lakes and swamps, or obtain more favorable ground. The surface is generally undulating, and there will be side hill grading sometimes required, but the whole work will be light. The slopes will be very gentle, and but little cross-laying needed.

The county road above referred to was cut out by the settlers on the Dwamish and White rivers as a means of communication with Seattle, but the breaking out of the late Indian war dispersed the settlers and interrupted the further progress of the work. It has never been used, I believe, and is now much encumbered with the

down the river and crosses it nearly opposite the mouth of a small stream called the "Pill Chuck."

But a small portion of the river bottom passed over by the line is subject to overflow, and the Indians say that it only occurs in very extraordinary freshets. The marks on the trees would seem to indicate that it never exceeds two feet.

The ridge passed over on this section is composed of clay mixed with gravel, and is not likely to be miry in any weather; even in the creek bottoms, where there is swamp, gravel is found within a foot or two of surface. The streams require no bridges, and are not, apparently, subject to any extraordinary overflows.

The timber, where it has not been burnt, is large and open. In general, however, the ridge has been overrun by fires, at different times, and is covered with a thick growth of young firs and fallen timber. One fire of recent date has nearly entirely cleared about two miles of the ridge.

The amount of grading and cross-laying for the length of road is small, and will occur generally at the streams. There are also a few wet places on the summit which will need cross-laying, and an occasional small ridge which will need side-hill grading.

The Dwamish river has a general northwest course, is about eighty yards wide, and its banks are, in general, about ten feet high. It seldom overflows, not more than about once in three years. It has been ascended for a few miles by a very small steamboat, but its navigation is difficult, on account of snags in the channel.

The bottom lands on this river are of the finest quality, and many persons were settled on them and engaged in farming, previous to the late Indian war. They were driven off, however, and but few have since returned. Coal of very good quality has been found in at least two places on the ridge running along the river.

Land of good quality has been found along Lake Dwamish and Salmon bay, and this region, together with the White river country, of which it is the outlet, will be capable of supporting a large population, and valuable for its minerals.

The Snohomish river was explored from the crossing of the road to its mouth. Its banks are generally low and much cut up by sloughs. On either side are swamps, and it does not offer much inducement to settlers. The country above the line was not examined. The tide rises several feet at the line.

But one bridge will be required in this section, across a slough in the Snohomish bottom.

Estimate of cost of section.

12 miles, to be cleared of fallen timber and cut out to twenty feet, and partly graded, at $200	$2,400 00
26 miles, including clearing, grading, and cross-laying, at $530	13,780 00
One bridge over slough	250 00
Ferry over Dwamish river	500 00
Total	16,930 00

THIRD SECTION.

Between the Snohomish and Stilaguamish rivers; length, 20 miles; general course, N. 6° W.

The line crosses the Snohomish a short distance below the mouth of the "Pill Chuck," or Red-water, a mountain stream which takes its rise in the Cascades and, passing through some three hundred yards of bottom land, ascends a low spur of the high and narrow ridge which runs off down the river. In about two miles another and higher spur is crossed at a ravine, and descended by a gradual slope to a branch of the "Pill Chuck." The opposite side of this stream is high, but slopes upward gradually. Thence, passing two ravines, and passing near a small lake, the road strikes the head of a large lake, some four miles long by about one broad, which has an outlet, as the Indians say, to the "Pill Chuck," and ascends by a long and gradual slope to the summit of a broad and flat ridge, or rather plateau, which continues on nearly to the Stilaguamish river. About seven miles beyond the lake is the Colseda, a stream which empties into the small bay at the mouth of the Snohomish.

The edge of this plateau is not, in general, more than from half a mile to a mile from the road, and is cut up by ravines, some of which are long and deep. The banks of the Colseda, where the line passes, are quite low, but below the road are steep and rugged.

The length of some of the ravines makes it impossible to avoid them, and after quitting the Colseda four are crossed, two of them near their heads, as also is a maple swamp, which, though of small breadth, is very long. About a mile from the last ravine the line descends from the plateau, which is here about one hundred feet high, crosses a small prairie and ascends a ridge, which it crosses and descends by two benches, in about two miles, to the Stilaguamish river, which it passes about four hundred yards below the mouth of its main fork, which empties into it from the south.

The last ridge passed is not as high as the plateau, and the natural slope of the ground will allow of a very favorable grade.

The first eight miles of the section is the roughest part of it, and considerable grading will be required in crossing the first high spur, the branch of the "Pill Chuck," and along the two lakes. This latter, however, will be light side hill grading.

Beyond the head of the large lake the country is flat, and the only work required will be in passing some of the ravines and descending from the plateau. Of the ravines only two will present any serious obstacles. One of them is deep and broad, and both banks will have to be graded for about 100 yards each to obtain an easy slope. The other is deep and narrow, and could be most advantageously passed by a bridge. By cutting the banks down for a few feet it would then be passable without difficulty. The other ravines are passed near their heads, and will only need, generally, a few yards of cross-laying and grading. In descending from the plateau to the small prairie above mentioned the natural slope of the ground will admit of a tolerably easy grade.

The amount of cross-laying is comparatively small and will occur chiefly in passing the lakes and the heads of the ravines. There is but one swamp passed, as noted above, and that a small one.

The soil, in general, is composed of clay mixed with gravel, and is not very suitable for cultivation. Some portions of the plateau near the Stilaguamish appeared to be of better quality, and the small prairie, containing about 60 acres, is excellent land, and produces fine potatoes. There is also good land on the "Pill Chuck," which is cultivated by the Indians. There is but one white man residing in this section, and he is located on the coast of the Sound, at a place called Tulelip bay, where he raises wheat and vegetables. I did not see him on his claim, but received this account from the man in charge of the canoe.

The country below the plateau, towards the Sound, was partially explored during the reconnaissance, and was found to be low and swampy, and intersected by numerous small streams.

The timber is generally large and chiefly of fir. Above the lake, a few miles, is an old burn, where the ground is covered with logs and brush. The rest of the line is comparatively clear. Near the Stilaguamish is a recent burn, made just before my arrival, through part of which the line passes. The fire had chared away everything except the largest logs.

The Stilaguamish was examined for about 2 miles, and was found to be a rapid, crooked stream, and much obstructed by rapids and sand-bars. These latter are numerous, and often reduce its channel to but a few yards in breadth. Between the banks the river is from 50 to 80 yards wide. It is fordable at the crossing of the line, and probably in many other places. Its bed is composed of small boulders of various kinds of rock.

The bottom land on either side appeared to be of irregular breadth, say from a quarter to half a mile in width, and contained many swamps and small lakes and streams. There is, however, on the northern bank some good maple land, not subject to overflow, and excellent for cultivation.

A ferry will not be needed throughout the year on this river, but will be indispensable in high water.

Estimate, &c.

20 miles cleared, graded, &c., at $550	$11,000 00
Bridge across ravine	200 00
Ferry on Snohomish	600 00
	11,900 00

FOURTH SECTION.

Between the Stilaguamish and Skagit rivers; length, 18.5 miles; general course, N. 12° W.

After passing the Stilaguamish the line follows down the river, which here runs a northwest course for about a mile and ascends the

bluff, which is not more than about 30 feet high, where it is cut by a small stream. In about a mile a large swamp is crossed at its narrowest part; and in another mile, the Menachem, a branch of the Stilaguamish, is reached. The right bank of the stream is generally steep and much cut up by ravines. The line crosses it, therefore, and follows up the left bank over more favorable ground for about two miles, where it quits the main stream and ascends one of its branches to its head, which is a large swamp, having high hills on either side, and passing around the bases of these crosses a low divide, and enters a valley containing two lakes, which are connected with each other by a stream which empties into the Skagit river.

This valley is narrow, and enclosed on either side by ranges of hills with rocky summits. The first lake is small; is about three-fourths of a mile long, and nearly semicircular in shape. The second is about 2 miles long, and from 400 to 500 yards broad.

In this valley the road continues for several miles, passing to the eastward of both lakes, and crossing their outlet several times, as the ground is more or less favorable, and finally leaves it not far from where it enters the Skagit bottom.

Here, in order to avoid the overflowed land with its numerous sloughs, small lakes, and swamps, the line turns to the eastward, and crossing a flat ridge of moderate elevation, and a slough, passes the summit of a ridge, about 100 feet high, and turning again to the northwest, skirts the level ground at the foot of the hills, which here come close to the Skagit, and passing along its bank for half a mile crosses it nearly opposite the mouth of a small lake.

It will be seen by the above description that this section differs entirely from those which precede it, being more mountainous, and the line following the courses of streams, instead of passing along ridges. As a consequence, the road will be more winding and rougher.

The bottom of the Stilaguamish will require cross-laying in places where the ground is a little miry, and a bridge over one of the creeks passed. The high land, as far as the Menachem, is level, but has one large swamp, before alluded to, which will require about 200 yards cross-laying. Several small branches of this stream, which take their rise in the swamp, will require small bridges and cross-laying. The bluff, the southern bank of the Menachem, and both banks of its tributary, when crossed, are each from 30 to 40 feet, but not steep, and the slopes will admit of any easy grade.

The Menachem, itself, is a considerable stream, broad between its banks, but with little water. Its bed is of sandstone in places; it rises, of course, considerably in winter, but needs no bridge.

In passing up its left bank the ground is sometimes rough, and will require side cutting in places, particularly in passing an island in the stream. There is also a narrow ravine to pass, which had better be bridged, as suggested in the previous section. Its tributary, which the line ascends, is a small stream, but a few feet wide. Along it the ground is generally level, and the only work to be done will be to cut down the banks of the several small streams which flow into it. The ground is undulating along the swamp in which it heads,

and will not require much work except in passing some small streams, at each of which there will be cross-laying and about one hundred yards grading in crossing the divide and ascending to the summit of the flat ridge which borders the eastern edge of the first small lake, the ascent to it being very gradual. This ridge is about ten feet high, with a side slope of about 25°, and has a deep cañon on the opposite side, which I took to be the head of another branch of the Menachem. There will be at least two hundred yards of side hill cutting in descending to the outlet of the lakes, with a grade of one in five.

Between the two lakes the line crosses the outlet four times. This stream is generally about twenty feet wide, with banks about eight feet high, and is very winding. But one of the crossings at the foot of the lake, where it is wider and deeper, with a bad bottom, will need bridging. It does not overflow its banks.

Part of the distance between the lakes is over high ground and side hills, and will require nearly half a mile of grading. The slopes will be easy, however, and the work not heavy. The other parts towards the head of the large lake is through the bottom of the creek, and will require cross-laying.

Along the large lake there will be about five hundred yards side cutting, part of the way, however, being very level. After leaving the lake, the outlet is crossed twice, the intermediate distance being generally level but elevated, and only requiring a little grading at each crossing, and in passing two small streams, with about thirty yards of cross-laying. Each crossing will require a bridge. The same may be said of the flat ridge and slough next passed over.

The ridge beyond the slough is perhaps one hundred feet high. Its southern slope is steep in places and will require about three hundred yards grading, most of it light work. There will be no difficulty in obtaining an easy grade. On the summit, Schiston rock, very much disintegrated by the weather, shows itself in knolls. There will be no necessity to cut it in making the road bed, or if any should be found in the side grading, it can be easily worked with the pick alone. The northern slope of this ridge is exceedingly gentle, requiring no grading whatever. At the foot of this slope is a small stream, which flows into a very small lake in the Skagit bottom, which is miry and will require a bridge. From thence, nearly to the river, the road will be dry and level. In the Skagit bottom there are three sloughs to pass, each of which will require elevated bridges of from thirty to forty feet in length. The opposite side of the river presents no better aspect.

The rocky ridge which forms the western side of the valley appears to end near where the outlet of the lake is last crossed As none of the rock shows itself in place on the line, it was not particularly examined, but from loose specimens and boulders was supposed to be greenstone or trap.

Throughout this section there is an unusual amount of fallen timber and underbrush. The valley of the lakes, particularly the side hills, in many places are almost impassable from this cause. There is much more variety in the species than in the preceding section, there being

much cedar, maple, alder, willow, and spruce, as well as fir and pine. Some of the cedars in the Skagit bottom were of immense size. Two, at least, that were seen, could not have been less than twelve and fifteen feet, respectively, in diameter.

There are places here and there along the line, which are fit for cultivation. In the Stilaguamish bottom, as before remarked, there is good maple land, as also in the branch of the Menachem, near the large swamp.

To the east of the large lake, and at its head, at the last crossing of the outlet, and some distance below it, and on the slough, at all of which points the Indians have permanent homes, and plant potatoes, there are good locations. There is a fall in the outlet, which the Indians told me of, but which I did not see, which would be valuable probably for a mill site. There is a lake also in the hills, near the Skagit, which I did not visit for want of time, but which the Indians described as a very large one.

The Indians have a trail from the mouth of the outlet, which empties into the Skagit, about three miles below the road, to the foot of the large lake, and another from its head to the foot of the small lake; they are but little used.

The Skagit bottom was explored on both sides of the river in different directions, and was found to be very wide, in some places more than a mile, but heavily timbered, much cut up by sloughs and full of swamps and small lakes. Much of it is subject to inundation, and the soil is sandy. On the left bank, however, back of the river, there is some good land. A more extended exploration would probably discover much good soil.

The Skagit river is large and deep, being from one hundred and fifty to two hundred yards broad. It is exceedingly crooked, but has a general southwest course. Its current is not very rapid, and it would probably be navigable for many miles by light steamboats. Unfortunately, however, it has two large rafts, about six miles above its mouth. One of them is about a mile, and the other a quarter of a mile long, and a portage of some two miles is necessary to pass them with canoes. There is a lake near the left bank and opposite the larger raft, which much assists the transit, however.

A ferry, of course, will be necessary on this river.

Estimate of cost of section.

18.5 miles cleared, graded, &c., at $750	$13,875 00
Bridges	2,000 00
Ferry on Stilaguamish	700 00
	16,575 00

FIFTH SECTION.

From the Skagit river to Bellingham bay; length 24 miles.

The general course of the line may be thus stated: Taking a northwest course from the Skagit, in about three miles it crosses a large swamp

and a mountain spur to the Samish river, at its base. On leaving the river the line turns more to the north, crosses the Samish prairie on the banks of the river, and another spur just beyond it, and in three miles arrives at another small prairie. Resuming its northwest course, in two miles the line descends a bluff of 40 feet to a small stream which empties into the outlet of Samish lake. The opposite bank of this stream is very low. The line now runs along the base of the high sandstone ridge which separates Lake Whatcom and Samish, and, passing along the eastern edge of the latter, follows a small stream, which empties into the lake, to its head, and, crossing a low divide, enters a narrow valley between the Lake Whatcom range and the ranges on Bellingham bay, in which it continues until it crosses the outlet of Lake Whatcom, which empties into the bay a little below the town of Whatcom. From this point it follows the high lands along the shore for 3½ miles to Fort Bellingham. The general course of the line to Whatcom is N. 25° W., and from thence N. 65° W. The rough character of the ground necessarily makes it somewhat winding.

The Skagit bottom at the crossing is never overflowed, and from thence to the edge of the large prairie is good and level ground for two miles, except at some dry sloughs which are passed. These are very shallow, and will only require cross-laying. The swamp is at least half a mile across, and will have to be cross-laid for that distance. It never is very wet.

The mountain spur, which is ascended directly from the swamp, is about 400 feet high, and is crossed at its lowest point, where it is cut by a deep gorge. Its southern slope is long and gentle until near the summit, where it becomes steeper. The northern slope descends to the Samish river in three "benches," the edge of each of which are steep, having a slope of about 30°, and will require much work. The best grade which can be obtained on this side will be as 1 to 4 or 5. There will be from 800 to 1,000 yards grading altogether. The summit of this hill is composed of schist, or slate rock, which will have to be cut through for about 80 yards. It is easily worked, however, being soft and readily broken.

The Samish river, at the base of this mountain, has a southwest course, and is 20 or 30 feet wide. It is rapid and subject to extraordinary rises, and will require a bridge of about 40 feet.

The ridge beyond the prairie is about 100 feet in height. Much work will be required on either side. A grade of about 1 in 5 can be obtained.

From the foot of this ridge to the branch of the outlet there are three points requiring grading. Before reaching the small prairie a flat ridge is to be ascended, where there will be about 200 yards side cutting. An easy grade can be obtained. After leaving the prairie for half a mile, the line passes over undulating grounds at the foot of hills, some of which will require light grading. Several very small streams are also passed, which will require their banks to be cut down and small bridges. The bluff on the stream is about 40 feet high, and can be passed with a grade of 1 to 5.

For about two miles beyond the stream, at the foot of the sandstone

ridge, the ground is generally even, only requiring light grading in places, and ascends very gradually. Just before reaching the side of the lake a stream and a narrow are crossed, each of which will require bridges. At the side of the lake the hills come steeply down to the water's edge in several places, and the slopes are covered with loose rock. At these places the road bed should be at least 15 feet wide, to allow for the slipping of loose rock from above. There will be a great deal of heavy excavation at this point. The sides of the hills have a slope of about 30°, but I do not think that there will be any rock cutting required.

In passing up the small stream at the head of the lake there will be much grading, as the line is still obliged to keep on the steep hill sides, in consequence of the narrowness of the valley, the bottom of the stream being swampy. The grades will be gentle.

This valley, in which the line now runs, is formed by the Lake Whatcom range on the one side, and the isolated ranges along the shore of Bellingham bay, and between the small streams which empty into it, on the other. These streams head in the main range.

The valley is, in general, very low, and the surface of the ground, as may be expected from the proximity of mountains on either side, very uneven. The grade throughout will be very easy, but more or less work will be required on every part. The heaviest portion of this work will be between the heads of the last two small streams. Here, for about a half mile, the ground is steep, and will require side-cutting the whole way. Of this about 300 yards will be heavy work.

The outlet of Lake Whatcom will require a bridge and the banks to be cut down.

From this point to Fort Bellingham is about 3½ miles. The ground is level except at the banks of the streams and ravines, of which there are six passed. At each the bank will have to be graded, and three bridges will be necessary. The creek passed (Squalicum) is five or six yards wide. Its banks are about twenty feet high.

Except at the large swamp at the foot of the Samish hill, there will be no large amount of cross-laying. No other place will need more than forty or fifty yards of cross-laying.

Lake Whatcom, which was visited during the reconnaissance, was found to be a large and beautiful sheet of water about 12 miles long. Its breadth is not great, not being in any place over two miles broad. On either side are high and rugged mountain ranges. Its general course is about southeast and northwest, and its foot is about 4 miles from the town of Whatcom.

Lake Samish is about two and a half or three miles long, by one broad, and has an outlet which empties into the Sound below Bellingham bay. It is three or four miles distant from the shore of Bellingham bay, and has mountain peaks at its head and on both sides. The valley of its outlet was found to be swampy wherever visited.

The timber in this section is generally fir, of large size and very thick. The ground is covered with underbrush and fallen logs. In the valley leading to Whatcom, however, much of this has been cleared off by fire.

There is but little good land in this section except in the Skagit

bottom and in the two prairies; both of these are small. The Samish prairie contains about 200 acres, and the other perhaps 40. The Indians plant potatoes in them, and their soil is excellent. At the foot of Samish lake there is also some good soil.

There is an Indian trail not far from the first part of the line, which starts from the Skagit river, near the crossing, and goes to the foot of Lake Whatcom. One branch of it also goes to the foot of Samish lake. In travelling this trail to the former lake I found three small lakes, which are laid down upon the map.

Estimate of cost of section.

24 miles graded, cleared, &c., at $900	$21,600 00
Bridges	2,000 00
Ferry on Skagit	1,000 00
	24,600 00

Recapitulation.

Section 1, length	19	miles.	$7,350 00
Section 2, length	38	"	16,930 00
Section 3, length	20	"	11,900 00
Section 4, length	18.5	"	16,575 00
Section 5, length	24	"	24,600 00
	119.5		77,355 00

To this add estimated distance from Steilacoom to Puyallap, by territorial road, 17 miles, which will make the whole distance from Steilacoom to Fort Bellingham 136½ miles.

Remarks.

Great pains were taken in locating the road to keep the line straight on the various courses, and for this purpose one of the men who had had much experience as a chainman was specially employed. The country was carefully explored, particularly in the more difficult parts, both in the reconnaissance and location. Every effort was made to avoid as much as possible swamps and alder bottom, which, in this country, cannot be made passable without much expense, and require constant repair.

The river bottoms are the worst portions of the road, and it was impossible to avoid altogether the inundated land. They all overflow, but the soil of all of them is sandy, and will not mire.

The timber throughout the whole country is generally fir, the trees being mostly very large. There is also maple, hemlock, spruce, willow, and alder, and a few white pines and cottonwood. In the river bottoms and in swamps large numbers of cedars are found, some of which are of enormous size.

In speaking of the agricultural capacities of the country through which I passed I have simply given my opinion of what I saw, without venturing any judgment of what was not seen. The course of the road, passing over gravel ridges and through mountain passes, was not a very favorable one for discovering good farming land.

The cost of road will be very much increased by the difficulty of transporting supplies, particularly in the three last sections, and the want of forage for animals, as there is no grass on the whole route. The few small prairies on the route are all covered with fern. Allowance has been made for this in the estimates.

The geological features of the country are not very interesting. No rock in place was seen in the first three sections, though there were a few detached boulders of granite occasionally met. In the second section the rock seemed to be generally greenstone, trap, and slate; and in the fifth brown sandstone and conglomerate. The formation of the country does not give any great promise of finding the precious metals. One of my men was an experienced California miner, and prospected occasionally, but found nothing.

On my return to Seattle I met with some of the citizens of the place, who had recently been up the Skagit river on a gold hunting expedition. In this they were unsuccessful, but one of them gave me a piece of native sulphur, of which, he informed me, there were large quantities up that river in the crater of an extinct volcano.

I found many pieces of coal on the sand bars of the Stilaguamish river, and was informed by the Indians that there was a large bed of it on the south fork of that river. Since my return I have learned that this place had been visited by Mr. Goldsborough, and that the coal had been tested at San Francisco and found good.

Coal of excellent quality is also found not far from the line of the road in the Dwamish river in two places, and on Cedar, Green, and White rivers, to which it is the outlet. The coal mine of Bellingham bay, now in active operation, under the charge of Colonel Fitzhugh, is well known throughout the country.

Game is very abundant in this region. The trails of bear, deer, and elk were frequently crossed, although the animals themselves were seldom seen. Grouse are also very numerous.

The most important parts of the line to put in operation at the present time are from the Puyallup to Seattle, and from Fort Bellingham to Whatcom.

The want of a land route to Seattle was severely felt during the late Indian war, and will be of great importance in case of any future outbreak.

Between Fort Bellingham and Whatcom, at present, there exists no communication except by the beach or by water, and it would be very difficult for the garrison to assist the town in case of an attack.

The Indians, wherever met, were friendly, although I have reason to know that they viewed my coming with suspicion, and that some of them did not like the idea of having a road made through their territories. The only instance where I met with any evidence of this feeling was on the Skagit river, where the band at the mouth of the river had told the upper or Loco-Chamis tribe not to lend me their

canoes to cross. The latter, however, paid no attention to them, but readily gave me whatever assistance I wanted. On my return, to increase their friendly feelings towards the whites, I distributed a few presents among them.

The "influenza," then prevalent in the settlement, had also spread among them, and had proved fatal to many. Different bands, also, on the river, were at war with each other, and I heard of many being killed.

The line was very carefully and completely blazed throughout, and there will be no difficulty in finding it.

Accompanying this report are maps of each section, drawn on a scale of two inches to the mile, and also a general map of the Sound, on a smaller scale, showing the general course of the line.

In justice to others I should mention that I was most materially assisted in performing this work by two of my employés, Thomas Prather and William Simmons, who, under my direction, made many explorations with much activity, zeal, and intelligence.

I trust, sir, that I have discharged the duty assigned me to your satisfaction.

I am, sir, with much respect, your obedient servant,

W. W. DE LACY.

Lieutenant G. H. MENDELL,
United States Topographical Engineers.

APPENDIX H.

Annual report of Captain A. W. Whipple, Topographical Engineer, to the Bureau of Topographical Engineers, October 1, 1858.

1. ST. CLAIR FLATS IMPROVEMENT.
2. CONSTRUCTING LIGHT-HOUSE AND BEACON ON ST. CLAIR FLATS.
3. ST. MARY'S RIVER IMPROVEMENT.

OFFICE ST. CLAIR FLATS AND ST. MARY'S RIVER IMPROVEMENT,
Detroit, October 1, 1858.

SIR: In compliance with your instructions I have the honor to submit the following report of operations for the past year upon duties connected with the War Department:

1. *Deepening the channel over the St. Clair Flats.*—At the date of my last annual report, September 1, 1857, a cut from 40 to 45 feet in width and about 14 feet in depth had been excavated entirely through the flats from the river channel to the deep water of the lake. The remnant of the appropriation for this work, then on hand, was $36,391 94. According to my calculation at that time, there was required, in order to obtain a channel of the width and depth recommended by the board of engineers and approved by the department, $23,421. Afterwards, in my letter of January 18, 1858, for reasons mentioned, it was deemed proper to excavate two feet deeper

than had been estimated for, which increased the original sum to $54,037. No additional appropriation however was granted by Congress.

The dredging was continued until August 26, 1858, when, the remnant of the appropriation having been nearly exhausted, the operation was suspended. In the accompanying appendix, "A," may be found extracts from the journals kept during the progress of the work, which will convey an idea of the manner in which the operations were performed and the difficulties encountered.

By the journal it is shown that since the date of my last annual report there have been excavated and removed from the channel of St. Clair Flats 127,368.5 cubic yards. The total amount dredged under the contract is 150,760.5 cubic yards. After the close of the dredging a survey of the excavated channel was made, and a map embodying the results accompanies this report. It embraces the sites of the light-house and beacon, now in process of erection, as aid to the navigation of this channel. The river channel and soundings outside of the cut are copied from the excellent chart made in October and November, 1856, under the direction of Colonel James Kearney, topographical engineer, superintendent of the lake survey. Navigators are in great need of a chart of the improved channel of the south pass of the St. Clair, and I would therefore respectfully recommend that it be printed immediately for distribution. Many masters, from ignorance of the locality, run their vessels aground in the vicinity of the beacon, and yet, by my directions, the channel has been marked by buoys, so that, with a chart giving their positions, no difficulty would be experienced by day. I understand that even now, guided by a lantern placed on the stationary boarding vessel near the site of the proposed beacon, navigators who are acquainted with the channel frequently pass through it at night.

The chart shows the excavated channel to be, at the upper end of the cut, the narrowest part, 200 feet in width between the 12 feet curves. At the lower end its width is 275 feet, which is about the average width throughout. The least width between the curves, marking 13 feet depth of water, is 170 feet. The average width of the 13 feet channel is about 230 feet. The depths within this curve generally range from 14 to 15.5 feet.*

The Canadian government, someyears since, appropriated $20,000 for the improvement of St. Clair Flats, to be expended only upon condition that a channel of a certain size should previously be excavated. I believe 125 in width and 12 feet deep. The conditions being fulfilled by the operations performed under the appropriation of Congress, the Canadian government is now employed in widening the channel represented on the accompanying chart. This will give sufficient width for present navigable purposes. The question in regard to depth obtained it will be proper to discuss at some length.

* Within these 13 feet curves the chart shows several spots with only 12 feet of water over them. I have conversed with Mr. Page, chief engineer of public works of Canada, who has control of the work under the Canadian appropriation, and I expect, through his aid, to have the depth upon these shoals increased to 15 feet. I regret that I did not at first cut through the centre of the channel to a depth of 18 feet, even though the width thereby should have been diminished.

So long as the lake retains it present height we may assume that the depth in the channel will be at least 13½ feet. To ascertain the probable effect of fluctuation in lake level in future years it will be well to examine previous records upon

The rise and fall of the lake surface.

The most complete records I have seen of the height of water level, in this region, is that obtained by Jacob Houghton, jr., superintendent and engineer of the Detroit water works, and published in his report for 1857. He has kindly supplied me with additional records, made the present year, for comparison with those taken on the St. Clair by officers of the lake survey in 1856, and by Mr. M. Swiney, Mr. Stith, and Mr. Clift, under my direction, in 1857 and 1858.

Table showing the surface of the Detroit river, in feet and tenths of a foot, below the water table of the water works engine house, in the years and months given.

Months.	1819.	1830.	1836.	1837.	1838.	1839.	1840.	1841.	1842.	1847.	1849.	1850.	1853.	1854.	1855.	1856.	1857.	1858.
January	------	------	------	------	------	6.9	7.7	7.9	7.6	------	------	------	------	5.0	5.3	4.4	6.0	4.3
February	------	------	------	------	------	------	------	7.9	------	------	------	------	------	5.9	5.7	4.5	3.7	4.1
March	------	------	------	------	------	------	------	8.0	------	------	6.3	------	------	5.5	5.8	4.7	5.5	4.3
April	------	------	------	------	------	------	6.3	7.6	------	------	------	------	4.6	4.8	5.3	4.9	5.0	4.1
May	------	------	------	------	------	------	6.2	7.7	------	------	5.5	------	------	4.7	4.9	4.7	4.4	3.7
June	8.5	6.5	4.8	4.2	------	4.8	6.2	7.5	------	------	------	------	3.8	4.3	4.6	4.6	4.1	2.8
July	------	------	------	------	------	4.5	6.0	7.1	------	------	------	5.6	3.7	4.3	4.2	4.5	3.8	2.9
August	------	------	------	------	3.2	------	------	6.6	------	------	------	------	3.9	4.5	4.2	4.6	3.8	3.1
September	------	------	------	------	3.4	5.3	6.5	7.4	------	------	------	------	4.1	4.7	4.4	4.9	3.9	------
October	------	------	------	------	4.2	6.0	6.6	8.8	------	6.1	------	------	4.4	5.6	4.6	5.0	4.1	------
November	------	------	------	------	5.2	6.0	6.8	7.8	------	------	------	------	4.6	5.5	4.6	5.6	4.4	------
December	------	------	------	------	5.2	------	7.0	7.6	------	------	------	------	4.7	5.8	4.8	5.3	4.4	------
Deduced means	8.81	6.81	5.11	4.51	4.29	5.65	6.59	7.65	7.20	6.01	5.64	6.17	4.34	5.05	4.87	4.64	4.42	3.70

The observation of 1819 was made by Major Henry Whiting. The observations from 1830 to 1850, inclusive, were made by A. E. Hathon, who was many years the city surveyor. The observations since 1850 were made daily by direction of Jacob Houghton, jr., superintendent and engineer of the Detroit water works, and the figures in the columns show the monthly means. The observations made before the engine house was erected were made with reference to a known point, and were afterwards referred, by calculation, to the present base.

In 1854, the highest water was July 15 ..... 4.1
the lowest water was March 3 ..... 7.0
In 1855, the highest water was Dec. 31 ..... 2.7
the lowest water was March 20 ..... 6.3
In 1856, the highest water was Jan. 2 ..... 2.7
the lowest water was Dec. 18 ..... 6.0
In 1857, the highest water was Feb. 25 ..... 3.0
the lowest water was Jan. 15 ..... 5.5

The deduced means, which I have added to Mr. Houghton's record, were obtained from the partial observations, by applying to each monthly statement a correction acquired from the complete yearly records, as shown by the following table. Accuracy can hardly be expected from those depending upon a single observation. For instance, the survey of St. Clair flats by Captain Williams, Topographical Engineers, in September and October, 1842, indicates a height of water nearly the same as that shown by the map of the lake survey for September and October, 1856; yet the tables give 2.5 feet difference. Upon the chart of survey made by Captain Macomb, Topographical Engineers, in 1852, the depth of water was said to be one foot greater than in 1842.

Table of annual fluctuations.

	1841.	1854.	1855.	1856.	1857.	Mean of differences.
Mean	7.65	5.05	4.87	4.64	4.42	
January	—0.25	+0.05	—0.43	+0.24	—1.58	— .40
February	—0.25	—0.85	—0.83	+0.14	+0.72°	— .45
March	—0.35	—0.45	—0.93	—0.06	—1.08	— .57
April	+0.05	+0.25	—0.43	—0.26	—0.58	— .19
May	—0.05	+0.35	—0.03	—0.06	+0.02	+ .05
June	+0.15	+0.75	+0.27	+0.04	+0.32	+ .31
July	+0.65	+0.75	+0.67	+0.14	+0 62	+ .57
August	+1.05	+0.55	+0.67	+0.04	+0.62	+ .58
September	+0.25	0.35	+0.47	—0.26	+0.52	+ .27
October	—0.15	—0.55	+0.27	—0.36	+0.32	— .09
November	—0.15	—0.45	+0.27	—0.96	—0.02	— .25
December	+0.05	—0.75	+0.07	—0.66	—0.02	— .25

From the above it would appear that, usually, in the Detroit river the highest water occurs in July or August, the lowest in March.

° This is rejected.

In the autumn of 1856 a mark was placed upon a tree at the mouth of the Middle channel of the St. Clair river, distant about two miles from the cut of the South Pass; and observations to determine the height of it, above the surface of the lake, were frequently made while the dredging was being performed. The following are some of the records, compared with simultaneous observations in the Detroit river.

Date.	Surface of Lake St. Clair below mark on tree at Middle channel.	Surface of Detroit river below water table of water works.
	L. S.	
September and October, 1856	4.81	4.95
November 15, 1857	3.91	4.2
April 21, 1858	3.56	4.0
August 4, 1858	2.65	3.0
August 24, 1858	2.83	3.2
September 5, 1858	3.12	3.4
September 6, 1858	----------	3.4
September 7, 1858	----------	3.4
September 30, 1858	3.31	----------

It is probable that the observations at the lake were taken with less precision than those at Detroit; yet the comparison of the above shows a close coincidence in the changes noted. It is therefore inferred that the record of Mr. Houghton may be used as an index of the oscillations at St. Clair flats. Supposing, then, that we have now a depth of 13½ feet in the cut through the flats, its equivalent in former years would be as follows:

Date.	Distance of water surface below gauge, in feet and tenths.	Heights compared with level of 1858.	Equivalent depth of water in new channel.
1858	3.70	0.0	13.50
1857	4.42	—0.72	12.78
1856	4.64	—0.94	12.56
1855	4.87	—1.17	12.33
1854	5.05	—1.35	12.15
1853	4.34	—0.64	12.86
1850	6.17	—2.47	11.03
1849	5.64	—1.94	11.56
1847	6.01	—2.31	11.19
1842	7.20	—3.50	10.00
1841	7.65	—3.95	9.55
1840	6.59	—2.89	10.61
1839	5.65	—1.95	11.55
1838	4.29	—0.59	12.91
1837	4.50	—0.81	12.69
1836	5.11	—1.41	12.09
1830	6.81	—3.11	10.39
1819	8.81	—5.11	8.39

Colonel Charles Whittlesey, in an essay upon the subject of fluctuations of level in the North American lakes, having collected, as far as he knew, all the observations made by others upon this subject, states that the greatest range of the secular fluctuations between the most extreme high and low stage, determined by the yearly mean, is, for Lake Erie, four feet five inches. The greatest extreme, in the same lake, determined by the monthly mean, is six feet. The extreme temporary difference from the highest known stage, June 25, 1858, to the lowest known stage in February, 1819, is about seven feet.

The extreme ranges in Lake St. Clair are, doubtless, less than in Lake Erie, although the fluctuations evidently correspond in regard to time. We may again expect periods of low water, and it would seem proper now to take the necessary precautions to prevent the inconvenience that would be experienced by obstructions at this place.

In conformity with your instructions, I have endeavored to form a complete channel through the flats, and to render it as perfect as the means placed at my disposal by the appropriation would allow. This I claim to have accomplished; and, if I am correctly informed, all of the lake navigators are gratified at the result.

The capacity of the channel, however, was necessarily limited by the amount of the appropriation. This, as will be seen by a reference to the foregoing tables, may not be sufficient to insure a passage to large vessels during succeeding years. Supposing the waters to recede to the level noted in 1841, the present bed of the channel would be

but 9.5 feet below the lake surface; and for a season corresponding with 1819—though this was probably an isolated observation of a remarkable depression—less than 8½ feet depth could be carried through.

I deem it my duty to state these facts plainly. To remedy the evil, I respectfully suggest the propriety of placing the subject before Congress, with an estimate for excavating a cut, through the centre of the new channel, 150 feet in width and 4½ feet deep, so as to obtain, from the river to the lake, a depth of 18 feet during seasons of extreme high water, and 12 feet at periods of extreme low water. The length of the cut would be about 6,000 feet. This would afford 150,000 cubic yards of excavation, which, at 30 cents, would amount to $45,000. Add $5,000 for expenses of superintendence and contingencies, and the estimate amounts to $50,000. Should Congress deem it expedient to grant the appropriation recommended, it is my opinion that it would be sufficient to complete an excellent channel, such as would be essentially permanent, or, at least, would require no further expenditure of public money for a long series of years.

2. *For building foundations for a light-house and beacon on St. Clair flats.*—The plans submitted for these structures having been approved by the bureau on the 15th of June, 1858, materials for their construction were immediately sought for. White oak piles and timber of the best quality were found upon St. Clair river, but considerable time was necessarily consumed before they could be prepared for delivery.

The first pile was driven upon the 3d of August. Six more were driven upon the 5th, under the immediate supervision of Mr. E. W. Clift, with the following results, as given in his report:

No. 2. Length 30 feet, butt 14″, point 9″, 116 blows; number of feet driven 19; number of inches at last blow 3; fall of hammer at last blow 22′ 4″; weight of hammer 1,475 lbs

No. 3. Length 30 feet, butt 12″, point 8″, 98 blows; depth driven 18′ 11″; at last blow 4″; fall of hammer at last blow 22′ 3″.

No. 4. Length 30′, butt 12″, point 8″, 84 blows; penetration 17′ 9″; at last blow 5″; fall of hammer at last blow 21′ 9″. Head of pile crushed.

No. 5. Length 26 feet, butt 14″, point 10″; number of blows 78; penetration 14′ 7″; at last blow 2″; fall of hammer at last blow 21′ 11″.

No. 6. Length 27 feet, butt 15″, point 11½″; number of blows 115; penetration 13′ 2″; at last blow 1″. The only appreciable effect of the last five or six blows was to crush the piles. For the last fifty blows the penetration did not average more than one inch at each blow.

No. 7. Length 25 feet, butt 15″, point 11″; number of blows 70; penetration 8′ 6½″; for last four blows nothing; on the 66th blow half an inch. This pile was driven on the centre of a row. The earth seemed to have become so compressed as to offer much greater resistance than was encountered in its natural state.

The preceding gives a fair sample of the manner in which the piles have been driven at both light-house and beacon. The soil being a

compact sand, containing a small quantity of clay, was so difficult to penetrate that the pile driving has been tedious and expensive. I have no doubt of the solidity of the piles when driven, and of their capacity for supporting the weights they are to bear.*

The driving of the whole number of piles forming the two clusters required to support the light-house and beacon was completed upon the 21st of August. On September 30, on account of storms, breaking of machinery, and hardness of soil, only 200 piles had been driven.

The cribs to surround the piles, forming the support of the towers, were framed at Newport, Michigan. They were composed of best white oak timber, 12″ × 12″, made in the most perfect manner, and, at their corners, protected by clamps of boiler iron firmly bolted to the timbers. They have been sunk in their proper positions with 82½ cords of good pier stone.

The foundations for light-house and beacon rest in 7 and 8 feet water, respectively, and the cribs are 14 and 15 feet in height, rising 7 feet above the surface of the lake.

Our operations at this place have been very much interrupted by stormy weather. The autumn will probably be rough, and soon it will be too cold to construct masonry. Therefore I do not expect to accomplish much more at this place during the present season.

The concrete used in the foundations is made of Rosendale cement. The iron girders and beams for the floor of the keeper's dwelling are being constructed by Messrs. Cooper & Hewitt, of New York.

The appropriation was $30,000, which will complete these works, unless extraordinary difficulty should be experienced.

3. *For deepening the channel of St. Mary's river.*—Since my last annual report upon this work, a most important and gratifying change has been effected in regard to it, viz: the substitution of a new channel for that originally adopted. In April last the War Department, at my request, appointed a board of officers, consisting of Captain H. G. Wright, Corps of Engineers, Captain George G. Meade, Corps of Topographical Engineers, and First Lieutenant W. F. Smith, Corps of Topographical Engineers, to examine the three channels of St. Mary's river, and to report which, in their opinion, was the most favorable for improvement.

The following is a copy of their report:

REPORT OF BOARD OF OFFICERS.

LAKE GEORGE, MICHIGAN, *May* 15, 1858.

SIR: The board of officers ordered by the Hon. Secretary of War to examine the channels over Lake George, of St. Mary's river, Michigan, have the honor to submit the following report:

The board have made such examinations as were deemed necessary to verify the general accuracy of the chart furnished from the Office of

* The retarding force experienced with pile No. 2 is found to be, by calculation, 74,437 pounds. This is probably about an average of the weight which each pile driven is capable of supporting.

the Lake Survey, and herewith appended to this report, and have, in addition, made observations with reference to the currents and character of the bottom in the several channels. Upon the survey made in 1853, Captain Macomb, Topographical Engineers, submitted estimates for the improvement of the before known and used channel, called the Eastern channel, and the one discovered by the survey, called the Western channel.

From the fact that Congress appropriated money for the improvements of this last channel, for which the estimates were much greater, it is presumed that the intention was to make the improvement entirely within the limits of the United States. Since the date of the survey above mentioned, another partial channel has been discovered, which Captain Whipple, the engineer officer in charge of the work, believed to possess many important advantages over the Western channel with reference to its navigation, to be much less expensive in its improvement, and to be equally with the other entirely within the limits of the United States; and upon his report the order for the meeting of the present board was issued.

The estimate of Captain Macomb for the improvement of the Western channel was $160,772.

That of Captain Whipple, based upon a close examination of the character of the bottom, and a contract already entered into for the same channel, is $238,964.

Both of these estimates looked to a channel of 300 feet in width, with a navigable depth of 12 feet; but that of Captain Macomb having reference to a different stage of water, and the character of the material not being known at that time, accounts for the difference in the two estimates.

From an examination of the Western channel and the map furnished, the board are of the opinion that its great length and sinuosity, the fact that there can be no wind which will allow sail vessels to pass both ways at the same time, and the necessity of keeping about four miles of distance closely buoyed out, present very serious objections to the improvements of this channel.

The channel recently discovered, and known as the Middle channel, starts at its foot from nearly the same point as the Eastern channel, runs in a northwesterly direction, and for a distance of 7,600 feet is perfectly straight, of ample width, and has a minimum depth of 16 feet. From this point, and in the same general direction for a distance of about 4,900 feet, the depth varies from 11 feet to 7½ feet; and beyond this, and before reaching the head of the flats, is a space of about 900 feet in width, with a depth of 10½ feet.

The examination for currents made at the head of the Middle and Western channels show that they are very slight, with a general tendency to cross both channels in a westerly direction, so that, in this respect, neither channel appears to have the advantage. Should the Middle channel be improved, it would furnish a pass nearly straight and of only about 2½ miles in length, which could be readily passed by sail vessels, which would require but little buoying out, and might be easily rendered navigable at night by range lights placed on shore.

The estimate for the improvement of the Middle channel is about two-thirds of that for the Western channel.

The board have ascertained, upon application to Captain Whipple, that the government is pledged by the contract to improve the Western channel, and cannot make a change contrary to the wishes of the contractor without giving him a just claim for damages. But the contractor has, however, expressed himself willing to work under his present contract in the Middle but not in the Eastern channel.

The letter of the board to Captain Whipple, and his reply thereto, are herewith appended.

The board further understand that of the present appropriation there has already been expended on the Western channel about $20,000, leaving a balance of about $80,000 to be devoted to the improvement of the Middle channel.

In conclusion, therefore, the board would report—

1. That, in their judgment, the channel the most readily improved and requiring the least expenditure of money is the *east* channel.

2. That they deem the *west* channel, from its great length, its curvilinear character, and the very great expenditure of money required to complete it, as the one most decidedly the least eligible for improvement.

3. For the reasons that, notwithstanding the United States is pledged by the contract to excavate the Western channel, the contractor is willing to work in the *Middle* but not in the *Eastern* channel; that the effort to improve the Eastern channel would be a temporary obstruction to navigation; that this channel is clearly within the Canadian waters, while the Middle channel is in the territory of the United States; and finally, as, should the improvement be effected in both, the Middle, from its straightness and facility of being marked, would be the superior of the two, the board feel constrained to recommend that a change be made and the Middle channel be improved.

Respectfully submitted.

W. F. SMITH,
1st Lieut. Topographical Engineers.
GEORGE G. MEADE,
Captain Topographical Engineers.
H. G. WRIGHT,
Captain United States Engineers.

Colonel J. J. ABERT,
Chief Corps Topographical Engineers, Washington D. C.

In anticipation of the action of the board, the Senate passed a joint resolution authorizing the Secretary of War to cause the appropriation for the improvement of St. Mary's river to be expended on such channel as he might deem best. In the House of Representatives, however, the press of business prevented the passage of the resolution until some time after the report of the board had been submitted.

Meanwhile, there being no authority to suspend the work, the dredging of the west channel was carried on, at a great sacrifice of the appropriation, until June 12, 1858. Upon the 8th of June, if I mis-

take not, the joint resolution passed the House of Representatives. Upon the 9th, Colonel Abert called the attention of the Hon. Secretary of War to the fact, and recommended that the Middle channel should be adopted for improvement. This recommendation was approved by the Hon. J. B. Floyd, Secretary of War, on the 10th. Upon the same day I received notice of the fact by a telegram from the bureau, and immediately despatched Mr. Stith, with instructions to Sub-agent Forster to transfer the work from the west to the Middle channel Mr. Forster received my instructions upon the 12th of June, upon which date the dredging of the west channel ceased.

On the following Monday, June 14th, dredging was commenced in the Middle channel, which, by my directions, had been previously surveyed and marked out for the purpose; and since that date the operation of improving this passage has been progressing, under the immediate supervision of Mr. Forster, in the most satisfactory manner.

The difficulties encountered in excavating through the middle passage have been slight in comparison to those experienced in the west channel, as will appear by a reference to the reports and daily record of the work submitted in Appendix B.

In May I instructed Mr. Forster to make a survey of the East Neebish rapids, with a view to deepening and improving that dangerous passage. This work was attended by many difficulties, which are noted in the journal accompanying. The minute and accurate chart obtained, showing the continuity of the shoal across the west passage, is herewith appended.

On the 10th of June one dredge and one scow of the Lake George fleet commenced operations at the Neebish. Before the end of July a channel had been excavated 80 feet in width and from 14 to 18 feet in depth, excepting at a few points where large boulders were accidentally left, which have since been removed. Mr. Forster, in his report of the conclusion of this work, states that "the 12-foot shoal spots become 14 and 15; the 13 and 13½ become 15 to 16 feet." He adds: "I have sounded that channel so thoroughly that it seems to me that there is not one inch of the bottom that has not felt my sounding rod, and yet I cannot *swear* that there is nothing less than 14 feet. I could find nothing less, however, although the water was half a foot lower than when I made my survey in July. *I have confidence in the channel now.*"

I desire here to express my high appreciation of the intelligence, zeal, and ability shown by Mr. Forster in the management of this exceedingly difficult and laborious operation. Every duty has been performed with a conscientious regard to the best interests of the government. A chart of the improved channel is herewith submitted. In order to show its connexion with the east channel, and the ranges by which it should be navigated, I have made a reduction from the original drawings, and added to Mr. Forster's survey by enlarging the scale of the map of the Neebish rapids, made by officers of the Lake Survey and published by the Bureau of Topographical Engineers. I consider it important to navigators of the lakes that this chart should be printed for distribution.

I also submit herewith a chart of the Middle channel through the flats of Lake George, showing its length, depth, and condition upon the 30th of September; also, representing the conditions of the strata of clay and the beds of hard sand, as determined by the survey and by borings. The information embodied in this chart forms the basis of the estimates herewith presented.

The channel excavated through the flats is nearly one hundred feet wide from the top of the slopes, and seventy-five feet in width at the bottom, with depths varying from fourteen to fifteen feet. This gratifying result has been produced since June 14. The amount of "hard material" in this Middle channel proves to be less than was anticipated, and falls far short of the quantity which, according to the estimates, would have been found in the west channel. The soft material which comprises the larger portion of the excavation of the Middle channel is a reddish clay; it is excavated with great facility, and such is its cohesiveness that the channel banks, when formed, will never be likely to abrade. The quality of this material is like that of the finest potter's clay; when dried it becomes very hard and takes a polish like Parian marble. I have seen many specimens of it carved by the workmen into finger rings and other ornamental forms. The land, not hard, is also very fair for dredging, though by no means so profitable to the contractors as the clay; even the portion which is classed as "hard material" is less difficult to excavate than much of that found last year in the west channel.

On the 3d of May the water level of the lake, as ascertained by a bench mark established at Gem island, was found to be six inches lower than on July 11, 1857, when the gauge was established. From the 3d of May the water began steadily to rise, attaining its maximum height about the 25th of June, at which time it was one foot and $\frac{10}{100}$ higher than on the 3d of May, and .55 higher than on July 11, 1857. It appears that the waters began to recede again slowly about the 1st of August, and, at this date, (September 30,) the average height is .8 higher than on May 3, 1858. The average height of water is precisely the same now as it was about September 20, 1857; from which I deduce that the general level of the lake was the same for 1857 and 1858. The level is lower in the spring, highest in midsummer, and lower in the fall.

The dredging operations will be continued as late as the season will permit—probably till the 10th of November. Should the autumn prove favorable for dredging, 20,000 cubic yards additional may be excavated, and a channel nearly 120 feet wide be obtained. This would consume nearly $11,000, and leave about $23,000 only for the commencement of operations next spring.

From the accompanying records it may be seen that, since September 1, 1857, the total number of cubic yards excavated from the west channel is as follows, viz:

Last season	8,987.00
This season	8,952.57
Total	17,937.57

The quantity excavated from the Middle channel is 90,123.66 cubic yards, of which 5,112.77 cubic yards are classed as "hard material."

To complete the channel from the head of the deep bayou across the flat to the lake, 5,200 feet in length, 300 feet wide, to a depth of 14 feet, will require an excavation of 186,457 cubic yards, of which about 15,000 yards will be hard material. To render the depth uniform in section Z, upon the map, there will be required about 5,500 cubic yards of dredging. To straighten the natural channel, by widening the bayou near its head, would require an excavation of 22,000 cubic yards; this latter cut, though not absolutely necessary, would much benefit the channel for navigable purposes.

I would also recommend the deepening of the centre of the Neebish channel, 50 feet in width, to the depth of 17 feet, to prevent any danger in its navigation when, in succeeding years, the height of water becomes much less than at present. This would require an excavation of about 1,181 cubic yards.

Upon the preceding data the following estimate is based:

Estimate for completing the channel of St Mary's river.

Excavation upon the flats of Lake George—	
15,000 cubic yards hard material, at 91 cents.....	$16,875 00
171,500 cubic yards soft material, at 37 cents.....	63,455 00
5,500.....do.....do.....do.	2,035 00
22,000.....do.....do.....do.	8,140 00
	90,505 00
Add for contingencies 10 per cent.....	9,050 00
Total required to dredge a channel through the flats of Lake George 300 feet wide and 14 feet deep	99,555 00
The deepening the channel of the Neebish rapids 17 feet would require 1,181 cubic yards of dredging, at $10..	11,810 00
Contingencies	1,181 00
Total for Neebish.....	12,991 00
Total for the improvement of St. Mary's river.....	112,546 00
Deduct amount on hand from last partial appropriation.	35,000 00
Amount of new appropriation desired to complete the improvement of St. Mary's river.....	77,546 00

Should Congress deem it proper to grant the abovementioned sum, I do not doubt that the contractors would be willing to place sufficient machinery upon the work to complete the channel during the summer of 1859.

I have the honor to be, sir, very respectfully, your obedient servant,

A. W. WHIPPLE,
Captain Topographical Engineers.

Colonel J. J. ABERT,
Chief Corps Topographical Engineers, Washington, D. C.

Condensed daily record of amounts excavated at St. Clair flats from September 1, 1857, *to August* 26, 1858.

Date.	Number of cubic yards excavated.	Quality of material.	Remarks.
1857.			
Sept. 1	589	Sand and mud	Day clear and pleasant, with light breeze.
2	732	Coarse, hard sand and some mud.	Strong breeze from SW.; current in channel much stronger than in July last.
3	1,216	Fine sand	Day pleasant; dredges working well.
4	959	Coarse and fine sand and grass.	Continued fine all day.
5			Day opened with strong wind from SE.: no work accomplished.
6			Unpleasant during the day; wind NE. with rain.
7	522	Sand and mud	Commenced work at 6 a. m.; blowing fresh; dredging stopped at 6 p. m.
8	829	Sand, mud, and grass.	Work proceeding well; day pleasant throughout.
9	573	Sand and mud	Day pleasant; dredges experience difficulty in making steam.
10	744	Sand and mud	Blowing fresh during the day.
11	738.5	Sand & mud, very stiff.	No. 1 dredge repairing machinery.
12	1,136	Fine sand and coarse, mixed.	Dredges short of fuel; day pleasant
13			Blowing fresh from SW.
14	448	Sand	Steamer Canada passed over buoys; blowing hard during the day.
15	723	Coarse and fine sand	Commenced work at 10 a. m.
16	433	Sand and mud	Cloudy and unpleasant.
17			Blowing hard during day; wind S.
18			Lying in river; wind from north; rain.
19			Stormy during day; no work.
20			Strong wind from north.
21	263	Fine sand and mud	Moderate; one scow load dumped without being measured; not allowed.
22			Blew hard all day from SW.
23			Heavy sea on all day.
24	304	Sand	Preserved specimens found in channel.
25	449	Coarse sand	Day pleasant; dredges working well.
26	1,024	Sand and mud	Work progressing well; wind NE.
27			Blowing hard from SE. during the day.
28			No dredging; too much sea.
29			Heavy sea in channel; no work.
30			Strong wind from SW.; lying in river.
Total	11,568.5		
Oct. 1			Wind from SW.; blowing hard all day.
2			Tug visited channel; reports heavy sea.
3	385.5	Sand and mud	Started work at 10.30 a. m.; cloudy and unpleasant.
4			Lay in river during day; moderate.
5	714.5	Fine sand	Dredges working well; calm and pleasant.
6	1,026.5	Fine sand	Replaced buoys carried away by late gales.
7	1,079.5	Sand and mud	Very pleasant; ceased work at 7 p. m.
8	927.5	Coarse sand	Very foggy; scows leak sand badly.

DAILY RECORD—Continued.

Date.	Number of cubic yards excavated.	Quality of material.	Remarks.
1857.			
Oct. 9	772.5	Fine sand	No. 1 dredge broke hoisting chain.
10	655.5	Sand and mud	Very pleasant; dredges in good order.
11			Fresh breeze during day; no work.
12			Blowing strong, with rain all day.
13	696	Coarse sand	No 1 dredge broke hoisting chain; calm.
14	894.5	Sand and mud	Day opened pleasant; clear and calm.
15	547	Sand and mud	Steamer "Plough Boy" ran into No. 2 dredge, breaking speed.
16			High wind during day from NE.
17			Ran up in river; blowing hard NE.
18			Moderate and clear; no work to-day.
19			Heavy sea; too rough for dredging.
20			Strong breeze all day; frost in the night.
21			Blowing hard SW.; very cold.
22	175	Fine sand	Blew during morning; work started at 3 p. m.
23	571	Sand and mud	Moderate and clear; wind SE.
24			Heavy sea; too rough to work.
25			Blowing a gale; wind N.NE.
26			Strong breeze all day from NE.
27			Too much sea in channel for work.
28	602.5	Sand and mud	Left river for channel; moderate.
29	349	Coarse sand	Forenoon moderate; blew strong in afternoon.
30	248	Sand and mud	Dredges short of wood; went to Baltimore after some.
31			Blowing hard all day; raft ran into dredges, damaging them some.
Total	9,644.5		
Nov. 1			Lying in river; too much sea to work.
2			Wind from south; blowing a gale.
3			Too much sea for work; very cold.
4			Lay in river, it being too rough for work.
5			Strong breeze from southeast; no dredging.
6			Tug went to cut; reports heavy sea in channel.
7	484	Fine sand	Moderate, with heavy rain.
8			Raining most of the day, but no wind.
9			Blowing hard; had a little snow this afternoon.
10			Day opened with strong wind from west.
11			Tug gone to Baltimore after wood; blowing fresh.
12			Captain Whipple visited work, and returned same day.
13			Wind fresh from NW.; no work to-day.
14			Snowed during the night; blowing hard.
15			Water gauge registers 5 feet 8 inches; rough sea.
16	392	Sand and mud	Day opened calm but cloudy; tried boring apparatus, but could not succeed very well; the pipe being too small and not stout enough
17			Blowing a gale from W.SW.; went in river.
18			The weather still bad for dredging.

DAILY RECORD—Continued.

Date.	Number of cubic yards excavated.	Quality of material.	Remarks.
1857.			
Nov. 19	.....	.....	Strong wind during the day; tug returned from N. Baltimore.
20	.....	.....	Blowing fresh; weather thick; wind SW.
21	.....	.....	Snow and wind; dredges covered with ice.
22	.....	.....	Cloudy and disagreeable; ice forming on lake.
23	.....	.....	Tug stopped by ice in the river.
24	.....	.....	Wind from SW.; blowing fresh; ice three to four inches thick.
25	.....	.....	River blocked up by ice; freezing hard.
26	.....	.....	Quite cold; fresh breeze all day.
27	.....	.....	Moderate and thawing slightly.
28	.....	.....	Pleasant throughout the day.
29	.....	.....	Ice still blocks up the river.
30	.....	.....	Preparing tug to push through the ice.
Total..	876		
Dec. 1	.....	.....	Dredges laid up at Algonac.
2	.....	.....	Men at work fitting out dredges, &c.
3	.....	.....	Tug started for flats at 11 a. m. with dredges.
4	176	Coarse sand.....	Dredged for a short time to-day.
5	405	Sand and mud.....	Day quite pleasant; worked a short time.
6	.....	.....	Blowing fresh, with rain.
7	.....	.....	Strong wind S.SW.; buoys in channel taken up.
8	429	Fine sand.....	Weather pleasant in forenoon; quite cold.
9	.....	.....	Day opened unpleasantly; raining all day.
10	.....	.....	Lay in river during the day; blowing hard.
11	.....	.....	Took dredges to Algonac, &c.
12	.....	.....	Left with all hands for Detroit on tug; work stopped for the season.
Total..	1,010		
1858.			
April 14	.....	.....	Left Detroit for flats at 4 p. m., to stake out channel and prepare for work.
15	.....	.....	Found channel in much same state as last year.
16	.....	.....	Placed buoys and marked out the dumping ground.
17	466	Sand.....	Three dredges on the work; measured scows.
18	1,019	..do.....	Day opened pleasantly; dredges working well.
19	205	..do.....	Quite rough sea during day; worked a little.
20	1,182	..do.....	Dredges experienced difficulty in making steam.
21	.....	.....	Too much sea for work; visited water gauge, which showed a rise of 4¼ inches since November 17, 1857.
22	106	Sand.....	Daybreak, wind SE.; blowing fresh.
23	.....	.....	Blowing hard during the day.
24	.....	.....	Mr. Forster arrived to place stations; blowing hard.
25	601.5	Sand.....	Rather pleasant, with but little wind.

DAILY RECORD—Continued.

Date.	Number of cubic yards excavated,	Quality of material.	Remarks.
1858.			
April 26	323	Sand	Mr. Forster placed three stations in channel.
27			Blowing hard; dredges repairing.
28	1,267	Sand	Pleasant throughout the day.
29	598	Sand and mud	Strong wind from SE.; rather rough to work.
30			Mr. Richardson (foreman) arrived with one dredge and two scows, consisting of sand, and sand and mud.
Total	5,767.5		
May 1	561	Sand and mud	Morning cloudy; rather rough.
2			One of the "tripods" blown over in the night.
3	1,399	Sand and mud	Pleasant during the day; wind NE.
4	30	do. do.	Excavated portions of two scow loads, and was obliged to stop.
5	1,058	do. do.	Tried boring to-day, but with not much success.
6	651.5	do. do.	Tug arrived from Algonac with spuds for No. 4 dredge.
7	1,259	do. do.	Calm and warm; dredges working well.
8	1,117	Sand	One of the scows sunk in channel when nearly loaded.
9	25	Sand	Moderate and pleasant in morning, blew rest of day; not much work to day.
10	470	Coarse sand	Blowing fresh during the day.
11			Strong wind, and rained all day; no work to day.
12			Endeavored to raise sunken scow, but failed.
13	1,251.5	Sand	Dredges breaking down quite often during day.
14	937	Sand and mud	Another tug was added to the work.
15	585.5	do	Morning calm; blowing fresh in afternoon.
16	671	do	Material was composed partly of roots of grass.
17	280	do	A passing schooner ran into dredge, injuring it badly.
18	639	do	Strong winds from N.; gauge notes water ½ in. higher than May 7.
19	812	do	Some breakages to day; boats leak sand; favorable weather.
20	447	do	Strong wind from NW.; worked with but 2 dredges.
21	277	do	Strong winds from NW., hence dredging delayed.
22	992.5	do	Weather favorable; 44 yards material sunk in scow 200 yards from cut not included in daily amount.
23			Gale from W.NW., very severe; no dredging this day.
24	764.5	Sand and mud	Favorable; some breakages; one scow load not measured not allowed
25	131	do	9 a. m. strong wind from SE. stopped dredging; one scow load not measured not allowed.
26			Blowing hard from NE. no dredging done.

DAILY RECORD—Continued.

Date.	Number of cubic yards excavated.	Quality of material.	Remarks.
1858.			
May 27	868	Sand and mud	Scows leak sand; weather favorable; few breaks; took No. 4 dredge to L. H. site; bored 6′ 2″.
28	384.5	do	Strong winds; worked but 3 dredges; resumed boring in afternoon; failed in accomplishing what was required.
29			Blowing a gale from SE.; 1 dredge and 4 scows broke adrift.
30	176	Sand and mud	Dredged until 1 p. m., idle rest of day; blowing from SE. all afternoon; but 2 dredges at work from want of scows
31			Blowing a gale; no dredging.
Total	15,787		
June 1	825	Sand and mud	No work for 2 hours on account of wind; a scow sent away for repairs.
2	972	do	Dredging retarded by break in machinery; sufficient steam can't be raised on No. 4.
3	855	Sand	Suspended dredging at 4 p. m. on account of wind.
4	40	do	But 1 scow loaded on account of weather.
5	1,053	do	Very favorable day for dredging, and but one break down.
6	840	do	Favorable day, and but one break in machinery.
7			No dredging on account of wind.
8	725	Stiff and coarse sand	Dredging retarded until 9 a. m. on account of wind; several break downs to day; leakage of sand great.
9	713	Mixed sand	No dredging till 9 a. m.; wind strong till that time.
10			Blowing hard.
11	409	Stiff and mixed sand	High winds to day retarded dredging till noon.
12	265	Sand	Do. do. do.
13	595	Stiff and coarse sand	No dredging till noon, on account of wind.
14	1,302	do	Favorable day for dredging, and few breakages.
15	1,173	do	No. 2 idle all forenoon, repairing dipper handle; weather favorable.
16	876	do	No. 2 idle all day, waiting a new dipper handle; weather favorable,
17	1,341	do	No. 2 at work at noon; excavation easy.
18	1,103	Coarse sand	Some slight breakages to day; No. 4 wants steam.
19	751	Coarse and stiff sand	High wind; stopped work 3 hours; some breakages.
20			Fair weather; gauge denotes water falling 1¼ inch since June 13.
21	1,457	Stiff and coarse sand	Favorable for dredging; no break downs to day.
22	1,174.5	do	Several breaks in machinery to day.
23	794	do	No. 4 not at work; preparing dipper handle; several breaks.

DAILY RECORD—Continued.

Date.	Number of cubic yards excavated.	Quality of material.	Remarks.
1858.			
June 24	1,001	Stiff and coarse sand.	No. 4 idle yet; tolerable fair day's work.
25	1,179	do	No. 3 idle repairing dipper till noon; No. 4 at work.
26	1,310.5	do	All dredges broke down to day; idle about 2 hours each; worked till 11 p. m.
27			No dredging; weather fair; Sunday.
28	1,259.0	Stiff and coarse sand.	Favorable weather; slight breaks on Nos. 2 and 3.
29	1,558.5	do	Favorable weather; trifling breaks upon all dredges; water same level as on June 20.
30	1,181.0	do	Favorable weather; a succession of small breaks.
Total	24,752.5		
July 1			No dredging; weather unfavorable.
2	1,380.0	Stiff and coarse sand.	Favorable weather; a few trifling breaks of machinery.
3	538.0	do	No dredging until noon on account of high wind.
4			Sunday, no dredging; gauge denotes water level same as on June 29.
5	1,444.0	Stiff and coarse sand.	Weather favorable; some delays from breakages.
6	1,694.0	do	Do. do. do.
7	1,254.0	do	Do. do. do.
8	1,224.0	do	Weather favorable; No. 4 laid up for repairs of boiler at 3 p. m.; idle rest of day.
9	1,491.0	do	Beautiful weather; No. 4 at work at noon; no breaks.
10			High winds, no dredging.
11			Do. do.
12	190.0	Stiff and coarse sand.	Work retarded till noon by high winds.
13	907.0	do	Favorable weather; one scow dumped in cut in consequence of filling with water; not allowed; C. H. Stith has local superintendence of work.
14	1,549.0	Sand and mud	Much of the material very stiff; some slight breakages.
15	1,283.0	Stiff and coarse sand.	Dredges idle 2 hours in consequence of high wind; No. 4 dredge placed at upper end of cut to straighten out some ridges; weather favorable in general.
16	1,478.0	do	Weather favorable; slight breakage of machinery on No. 1.
17	1,572.0	do	Work ceased at 6 p. m. in consequence of high sea.
18			No dredging on account of high wind; Sunday.
19	1,561.0	Stiff and coarse sand.	Weather favorable; no breaks of any consequence.
20	1,735.0	do	Weather favorable; best day's work this season; no breakage to-day.
21	1,069.0	do	High wind at 5.30 p. m.; work ceased; one break down.
22	1,113.0	do	Weather fine; few breakages.

DAILY RECORD—Continued.

Date.	Number of cubic yards excavated.	Quality of material.	Remarks.
1857.			
July 23	885.0	Stiff and coarse sand	Dredging ceased at 3 p. m., in consequence of wind.
24	1,096.0	do	High wind till 9 a. m.; dredging commenced.
25		do	Sunday; dredges repairing machinery.
26	719.0	do	Dredging commenced at 2 p. m.; high wind till then; too rough in afternoon for dredging to be done properly.
27	1,646.0	do	High wind till 6 a. m.; no dredging done till then; some breaks to-day in machinery.
28	1,184.0	do	Dredging ceased at 5.30 p. m., on account of high winds.
29	1,313.0	do	No dredging until 7.30 a. m., on account of high wind; dredges working well during the day.
30	1,382.0	do	Removed No. 4 dredge to lower part of cut to level ridges.
31	1,323.0	do	Weather favorable.
Total	31,408.5		
Aug. 1			High wind; sounded lower part of cut, found least depth of water to be 12½ feet; soft bottom; this depth evidently caused by leakage of scows.
2	1,314.0	Coarse and mixed sand	Scows leak sand badly.
3	1,451.0	do	Dredges worked well throughout the day.
4	1,351.0	Coarse & mixed sand; some stiff.	No dredging till 7 a. m.; high wind; dredges working well.
5	1,585.0	do	Weather favorable; removed No. 2 to upper part of cut to level ridges, dredges working well.
6	1,542.0	Coarse and mixed sand	Work progressing favorably. Bow spud of No. 2 broken.
7	1,426.0	do	No. 2 resumed work; spud repaired; No. 1 idle 5 hours; machinery out of order.
8			Sunday; no dredging.
9	1,799.0	Mixed and coarse sand	Scows leaking sand very much.
10	1,373.0	do	Weather favorable; several serious breaks in machinery to-day.
11	1,306.0	do	No 2 at work but a few hours this afternoon.
12	1,724.0	do	Weather very favorable; no breakages.
13	1,372.0	do	Weather favorable.
14	1,045.0	do	Weather favorable; No. 4 not at work; spud broken.
15			No dredging; Sunday; fine weather.
16	1,246.0	Mixed and coarse sand	Weather favorable; No. 4 at work; No. 1 idle a short time.
17	1,070.0	do	No. 3 idle all afternoon till 5 o'clock; machinery being repaired.
18	558.0	do	But large dredge at work till 10 a. m.; wind high; work stopped at 4 p. m., on account of high wind.

DAILY RECORD—Continued.

Date.	Number of cubic yards excavated.	Quality of material.	Remarks.
Aug. 19	481.0	Mixed and coarse sand	No dredging till 7 a. m.; wind high; spu of No. 3 broken; not at work to-day.
20	289.0	----------	No work till 7 a. m.; wind high; ceased dredging at noon on account of high wind.
21	1,136.0	----------	Weather favorable; scows leaking sand badly.
22	1,022.0	Mixed and coarse sand	Blowing hard; no dredging; Sunday.
23	1,280.0	------do----------	Wind high; no dredging till 10 a. m.
24	1,348.0	------do----------	Favorable weather; dredges working well.
25	782.0	------do----------	Do. do.
26	----------	------do----------	Favorable weather; 2 p. m. operations suspended altogether; appropriation exhausted nearly.
Total..	26,500.0		

APPENDIX B TO ANNUAL REPORT, 1858.

Journal of operations connected with the dredging in Lake George, St. Mary's river improvement, under the direction of Captain A. W. Whipple, Topographical Engineers, J. H. Forster, United States sub-agent, W. W. Allen and R. D. Mullett, assistant sub-agents, Barton and Osgood, contractors, W. W. Williams, contractors' superintendent, A. D. 1858.

LAKE GEORGE FLATS, SAULT STE. MARIE RIVER,
October 6, 1857.

SIR: I enclose you a statement of the entire amount of work that has been done since I have been in charge at this place, commencing August 31 and ending October 5, with the amount of material which has been excavated and deposited during the above mentioned time.

The work has been confined entirely to the first division of cut No. 2, extending from beacon No. 8 to beacon No. 10, a distance of 1,000 feet. This division of cut No. 2 forms a ridge, and may be divided into three sections composing three different kinds of material, as follows:

The distance from beacon No. 8 to beacon No. 10, I will call 1,000 feet. The material at the starting point (beacon No. 8) is clay and sand, rather hard in places, although it is mostly soft clay for the distance of about 400 feet. The original depths of water in this portion was 10–10½ and 11 feet. The excavation is very good and of the required depth.

At the end of the first distance of 400 feet is a ridge of hard sand extending about 300 feet further, and which forms the second section. The original depth of water on this section was 11 feet. Excavated to the depth required.

The third section extends to beacon No. 10, and is about 300 feet in length. The depth was about 12 feet at the head, and grew deeper throughout its length till reaching the beacon, where was 13½ feet water. The excavation at the starting point in this section was one foot of soft clay and one foot of hard sand.

From beacon No. 8 we have made three cuts extending to the 13½ feet water, and one cut 500 feet in length. On reaching this distance the machinery got out of order, and the engineer not being able to make the necessary repairs the work was suspended.

The width of the channel from beacon No. 8 to the point where the dredging ceased is very uniform and measures 90 feet. The depth of water varies from 13 to 16 feet.

Had not the dredge been disabled at the point mentioned, I would have the whole channel of an uniform width and approximating the required depth.

The dredge, &c., have been towed into the river to be laid up, and operations have been suspended for this season.

Very respectfully, your obedient servant,

W. W. ALLEN,
Assistant Sub-Agent, in charge.

Capt. A. W. WHIPPLE,
Corps Topographical Engineers.

Daily record of excavations at St. Mary's river from August 31 *to October* 5, 1857, *inclusive*, W. W. ALLEN, *U. S. sub-agent.*

Date.	No. of cubic yards	Total No	Date.	No. of cubic yards.	Total No.
Aug. 31	160	160	Sept. 18	322	
			19	306	
Sept. 1	325		21	426	
2	752		22	57	
3	645		23	337	
4	335		24	217	
5	213		25	142	
6			26	120	
7	163		28	100	
8	244		29	155	
9	266		30	270	
10	332				7,578
11	200		Oct. 2	161	
12	569		3	440	
14	440		4	485	
15	330		5	163	
16	210				1,249
17	102				
					8,987

Daily record of amount of excavation at the East Neebish Rapids, St. Mary's river, under the direction of Capt. A. W. Whipple, during the months of June and July, 1858; *Messrs.* BARTON & OSGOOD, *contractors;* J. H. FOSTER, *U. S. sub-agent;* R. D. MULLETT, *assistant.*

Date.	Hour of deposit.	No. of cubic yards and feet in each boulder measuring over half cubic yard excavated.	Total No. of yards in boulders excavated and deposited.	Total No. of cubic yards of sand, gravel, and stones excavated and deposited.
1858.				
June 10				
11				
13	10.30 a. m.			18.00
14	7.30 p. m.			29.00
16	do			25.00
19	8 a. m.			22.00
22	5.30 p. m.			19.00
25	9 a. m.			14.00
29	10 a. m.	No. 1, 16 feet. No. 2, 18 "	1 yard 7 feet.	17.00
		Total for June	1 yard 7 feet.	144.00
July 1				
2	7 a. m.			22.10
3	11.30 a. m.			28.00
4	3 p. m.			9.00
6	12 m.			18.00
7	5 p. m.	No. 1, 19.2 feet. No. 1, 14.6 "	1 yard 7 feet.	27.00
9	11 a. m.	No. 1, 27.6 "	1 " 0.6 "	9.00
12	9.30 a. m.			25.00
14	8 p. m.	No. 1, 14.8 feet.	0 yard 14.0 feet.	21.00
15	3.30 p. m.	No. 1, 19.3 "	0 " 19.3 "	22.50
17	5.30 p. m.			23.30
19	3.30 p. m.			24.00
20	9.45 a. m.			22.50
21	7 p. m.	No. 1, 13.5 feet.	0 yard 13.4 feet.	7.80
25	6 p. m.			9.50
		Total for July	4 yards 1.2 feet.	268.07

Condensed daily record of amount of excavation at the flats of Lake George, St. Mary's river, under the direction of Captain A. W. Whipple, Topographical Engineers, during the months of May, June, July, August, and September, A. D. 1858; *Messrs. Barton and Osgood, contractors; J. H. Foster, United States sub-agent; W. W. Allen and R. D. Mullett, assistant sub-agents.*

Date.	Hard material.	Soft material.	Quality of material.	Remarks.
1858.	*Cubic yards.*	*Cubic yards.*		
May 3		242.00	Sand and clay	1 dredge at work; excavation good.
4	150.00		Hard yellow and dark sand	Operations conducted day and night without cessation.
5	198.00		Sand	
6	202.23		Hard sand	Depth of water, 8 feet 10 inches; cutting, 5 feet 2 inches.
7	212.23		do	Depth of water, 8 feet 10 inches; cutting, 5 feet 2 inches.
8	214.24		Hard sand, with streaks of clay	
10	212.72		do do	Depth of water, 9 feet 1 inch; cutting, 4 feet 11 inches.
11	195.68		Hard sand	
12	76.00		do	
13	82.83		do	Depth of water, 9 feet 3 inches; cutting, 4 feet 9 inches.
14	43.00		do	
16	54.66		do	
17	134.00		Hard sand, intermixed with clay	New dredge arrived yesterday.
18	101.50	100.00	Hard sand and soft clay	
19	123.88	576.15	do do	
20	85.00	349.32	do do	
21	34.00	197.46	Hard sand and clay, and soft sand and clay.	
22	205.00	327.57	Soft sand and clay, hard sand, soft, red sand.	
24	283.73	182.76	Red sand and clay, and hard sand	Excavation good; some hard dredging.
25	394.61		Hard, black sand, intermixed with red and yellow.	Difficult to excavate.
26	276.34	92.00	Hard sand, and soft, dark red sand	
27	336.77		Dark colored hard sand	Very difficult to excavate; dipper of No. 2 dredge inadequate to remove this material.
28	95.00		Hard sand	High wind and sea.

CONDENSED DAILY RECORD—Continued.

Date.	Hard material.	Soft material.	Quality of material.	Remarks.
1858.	*Cubic yards.*	*Cubic yards.*		
May 29				High wind on 29th, and no work.
31	124.83		Hard sand	New dredge, No. 3, arrived on 29th.
Total in May	3,836.25	2,077.26		
June 1	146.63		do	Many breakages of machinery.
2	224.07		do	Much time lost owing to frequent breakage of machinery; depth of water, 9 feet 6 inches; cutting, 4 feet 6 inches.
3	303.63	60.10	Hard sand, clay and sand	
4	114.55	12.00	do do	Work retarded by high wind and breakages.
5	108.00		Hard sand	
7	50.00		do	High wind.
8	336.59		do	Favorable weather; dredge No. 3 commences work; No. 3 broke down.
9	260.21	272.40	Hard sand, with clay intermixed	
10	153.30	38.56	Hard sand, sand and clay	At noon strong northwest wind; excavation fair.
11	131.99	206.67	Hard sand, and clay intermixed	Excavation fair.
12	233.47	386.89	Hard sand, with clay intermixed	Suspended operations in west channel to day.
Total in west channel	5,898.69	3,053.88		
June 14		383.76	Soft clay, sand and clay	At 4 a. m. work commenced on middle channel, in 14 feet water, at north end.
15		1,245.04	Soft clay and a little sand intermixed, clay of a brick red color.	Excavation is very fine; two dredges at present engaged on this channel. One dredge at East Neebish rapids since June 10.
16		1,142.25	Soft clay and sand	The material is of very superior quality as regards ease and facility of excavation.
17		1,113.41	Very soft clay, with a little sand	

18		1,092.50	Soft clay, soft sand and clay	No. 2 struck a narrow point of sand, rather hard.
19		1,105.37	Soft sand and clay	Depth of water, 11 feet 8 inches; cutting, 2 feet 4 inches; fine dredging.
21		1,154.38	Soft clay, with a little sand	Depth of water, 11 feet 10 inches; cutting, 2 feet 2 inches.
22		1,106.84	Soft clay	Depth of water, 12 feet; cutting, 2 feet.
23		1,182.83	Soft clay	Fair weather. Depth of water in line No. 2, 12 feet; cutting, 2 feet. Depth of water in line No. 3, 11.5 feet; cutting, 2.5 feet.
24		1,009.41	Soft clay, sand and clay	Cross hole or head of false channel 200 feet wide, 15 feet water.
25		1,178.06	Hard clay, sand and clay	Clay becoming hard and dry; color, dark red. Depth of water, 10 feet; cutting, 4 feet.
26		1,265.13	Clay, and clay with sand intermixed	No. 3 lost eight hours repairing.
28		1,027.96	Clay, with a little sand	Depth of water, 10 feet; cutting, 4 feet. The clay is quite stiff, and is found in layers or strata, about 1 inch thick, like the leaves of a book. It is fine material to excavate. The clay falls from the dipper as from a mould.
29		1,145.70	Chiefly clay	Depth of water in line of dredges is 9 feet and 9 feet 8 inches. Dredged successfuly, without any breaks to-day.
30		1,375.35	Clay, with a small proportion of sand	Very favorable weather for operating. Cutting, 4 feet.
Total in June	2,062 44	17,504.61		
July 1		105.43	Clay, with a little sand	Stopped work a part of day on account of high wind.
2		1,011.37	Clay, with a little sand	
3		817.95	Stiff clay, and clay and sand	Dredge worked but part of day; men gone to celebrate the 4th. Depth of water in line of dredging, 10 feet; cutting, 4 feet. Fine weather for operating.
5		1,175.71	Clay	Depth of water, 9 feet; cutting, 5 feet.
6		1,297.06	Clay, with a few spots of sand	Excavation very good.
7		1,504.79	Clay, with some sand intermixed	The dredging is performed with ease and advantageously. The clay is dry and brittle, and has a greenish cast. Dredges working well.
8		1,171.72	Clay chiefly, with some sand	Channel cut is dredged unevenly on bottom. The worst work is found to have been done during dark nights, when it is impossible to excavate correctly. Depth of water, 9 feet 2 inches; cutting, 4 feet 10 inches.
9		1,449.68	Clay, with a slight admixture of sand.	Fine dredging, and weather very favorable.

CONDENSED DAILY RECORD—Continued.

Date.	Hard material.	Soft material.	Quality of materials.	Remarks.
1858.	*Cubic yards.*	*Cubic yards.*		
July 10		1,400.60	Clay and sand	Excavations good. Nights dark. Numerous bars left in the night. Depth of water, 8 feet 10 inches; cutting, 5 feet 2 inches
12		1,475.72	Clay and sand	Material becoming hard in line of leading dredge; there is more sand. Dredging good. Depth of water, 8 feet 5 inches; cutting, 5 feet 7 inches.
13		1,093.72	Dark sand and clay	Favorable weather; excavations harder than common.
14		810.61	Sand and sand clay	Sand is coarse, of a dark color and yellow; of a different character from that found in the west channel; not so compact. Depth of water, 8 feet; cutting, 6 feet.
15		298.44	Coarse sand, and clay and sand	Difficulty with the dipper; much time lost to-day.
16	149.55	792.44	Hard sand and clay	Hard material in line of No. 2, leading dredge. Dredges allowed to retrograde about 600 feet; chains not strong enough for hard material. Movement temporary till stronger chains be procured.
17		1,392.20	Clay	Depth of water to be attained through sand is 15 feet, owing to movement on the slopes.
19		1,406.64	Clay, with spots of sand	Depth of water in line of dredges is 8 feet 10 inches; cutting, 5 feet 2 inches. Fresh breeze to-day.
20		1,602.64	Clay, with some sand	Very favorable weather for dredging. Very little detention from any cause to-day. Depth of cutting, 5 feet 6 inches.
21		919.73	Clay, with a little sand intermixed.	Dredging good. High wind and sea interrupted the work part of the day.
22		1,250.52	Sand and clay; clay predominating.	Depth of water, 7½ feet; cutting, 6½ feet. No. 2 broke shaft, and lost several hours. Excavation fine.
23		1,110.50	Sand in line of No. 2; clay and sand of No. 3.	At 6 a. m. dredge No. 3 repaired and returned to work. Ridge left last night; No. 2 sent back to remove it. Favorable weather for operating.
24		1,104.26	Sand and clay	New chains arrive. No. 2 advancing along east line of channel again. Considerable loss of time from breakage of machinery.

26	163.83	482.43	Hard sand and clay	It takes 1⅓ minute to fill dipper, raise and empty it; dipper two-thirds full; and it takes 2½ to 3½ hours to fill scow. Some of this time is due to high wind, which caused delay. Color of sand, black and yellow.
27		251.66	Clay and sand	Fresh N.W. wind caused work to stop at noon. Dredge No. 1 returned from the Nebish rapids; resumed work here.
28	181.00	943.85	Soft clay and sand, with some hard white sand	Three dredges at work. No. 3 reaches hard sand, and, being unable to dredge it, turns round on the 5th cut and retrogrades. Depth of water, 7½ feet.
29	193.00	833.64	Soft clay and hard yellow sand	Lost several hours on account of wind; and much delay from other causes. There are but 5 scows to serve 3 dredges, which causes much delay.
30	200.00	801.53	Hard sand and clay	At 6 a. m. No. 1 broke dipper; worked no more this day. Other breakages on other dredges. Favorable weather for operating.
31	144.33	1,146.43	Soft clay and hard white sand	No. 1 having repaired dipper, commenced work at 10 a. m. Nos. 1 and 3 are in soft clay; cutting, 6 feet. No. 2 in hard sand; cutting 6½ feet. Several hours lost from breakages in Nos. 1 and 3.
Total in July	1,031.71	28,446.11		
August 2	100.00	496.98	Hard sand, clay, and sand and clay.	Lost much time to-day on account of wind. Fresh blow from the S.E.
3	98.00	661.76	do do	Dredge No. 2 broke dipper and stopped work for the day at 10 a. m. Cutting 5 feet 8 inches.
4	439.00	718.41	Hard sand and clay	No. 2 dipper repaired; began work at 2.30 a. m.
5	346.00	733.32	Hard sand, clay, and a coarse loose black sand.	No. 1 dredge lost 10 hours in repairing machinery; excavation very fair in black sand. Depth of water, 7½ feet; cutting, 6½ feet on the first cut, and 7½ feet on all other cuts through the sand.
6	240.33	1,174.17	Hard sand, loose sand, and clay	Very dark night, and there are no lights set to guide the dredges; excavation good in loose sand.
7	68.00	1,438.93	Chiefly loose sand and clay	Very little delay to-day from breakages or other causes; cutting in sand 7½ feet.
9	88.00	975.51	Mostly clay and loose sand, with a little hard sand.	Dumping scow filled with water and capsized, losing her load. Much time lost from above cause, and breaking of machinery and want of scows.

CONDENSED DAILY RECORD—Continued.

Date.	Hard material.	Soft material.	Quality of material.	Remarks.
1858.	*Cubic yards.*	*Cubic yards.*		
Aug. 10	90.00	1,261.51	Chiefly soft sand and clay	Scow righted at 9 a. m.; dredge No. 1 lost 20 hours in righting this scow; cutting in sand 7 and 7½ feet.
11	122.00	1,190.60	Hard sand, sand and clay	Make good progress to-day; dredging good.
12	179.00	1,201.50	Sand, clay, and hard sand	The excavation is good in the sand, but difficult in the hard sand; very favorable weather for dredging.
13	140.00	571.77	Hard and soft sand	Considerable time lost to-day waiting for fuel and from breakage of machinery; cutting 7½ feet.
14	165.00	421.54	Hard fine white sand, and coarse yellow sand.	At 2.30 a. m. No. 1 broke machinery and stopped; 17 hours to repair; and No. 3 lost 17½ hours repairing; cutting 7½ feet; depth of water 7½ feet.
16	323.00	257.00	Hard and soft sand	No. 3 lost 8½ hours repairing machinery; machinery on other dredges out of order; the sand leaks through the bottom of scows badly; a considerable percentage lost while loading and moving to the dumping ground.
17	258.00	385.00	do	Excavation very fair; lost several hours on account of high wind.
18	198.00	326.00	do	Several hours lost from the breaking of machinery; lost 10 hours on account of high wind.
19	188.72	642.68	do	Excavation generally good in the sand, but some spots found hard; much time lost from breakages and want of fuel; cutting 7½ and 6½ feet.
20	94.56	462.62	do	Lost 10 hours to-day on account of high wind; character of excavation improving, becoming easier.
21		708.53	Sand.	Lost 7 hours to-day on account of high wind; excavation good.
23		1,129.30	Loose sand, with a little clay	Excavation good; No. 3 completes one cut through the entire length of the channel cut, to 15 feet water of the head of the natural channel; moved No. 2 back to beginning of hard sand 4th cut, and No. 3 takes No. 2's place in lines.
24		1,269.91	Clay and sand; dark loose sand and hard white sand.	Much time lost in repairing machinery; distance across the hard sand belt is about 300 feet.
25		1,138.71	Chiefly sand, with a little clay	Dredges working well; at 9 p. m. No. 3 stopped work for the day; boiler out of order.

26	132.00	648.85	Clay and sand and hard sand	At 9 a. m. No. 3 boiler repaired, resumed work and immediately broke her dipper; stopped work for the day; No. 1 lost six hours repairing.
27	123.00	813.88	Sand and clay; loose sand and hard sand.	No. 3 repaired at 1 a. m. and resumed work at 4; dredges stopped at 10 and 11 p. m, to repair.
28	162.00	890.44	Sand and clay; soft sand and hard sand.	
30	109.00	794.62	Hard and soft sand	Loose sand and clay in line of Nos. 1 and 3; sand in line of No. 2 hard in some spots, soft in others; 2 p. m. No. 1 broke machinery and lost balance of day.
31	88.45	989.21	Soft loose sand, with some hard sand.	4 p. m. dredge No 2 broke pump and lost balance of day; excavation very fair.
Total in August	3,752.06	21,302.77		
Sept. 1	50.00	726.56	Hard sand, soft sand, and clay	Excavation in general good.
2		403.18	Loose sand	Excavation very good; high wind stopped work at noon.
3		538.00	Loose sand, and very fine	Much material is lost from the scows before reaching the dumping ground; cutting varies from one to three feet; the dredges are going over ground the second time, cleaning up the work.
4		981.14	Fine sand loose, and sand and clay	Excavation very fair; lost several hours in repairs.
6		457.43	Clay and sand, and fine sand	Did not get to work till 4 a. m.; excavation fair; strong gale; stopped work at 9.30 a. m.
7		780.97	Sand and clay, and fine sand	Excavation very fair; lost several hours on account of wind; night very dark; progress slow.
8		976.99	Sand	Lost several hours repairing; excavation very fair.
9		785.04	Sand, and sand and clay	One scow load dumped short of the dumping-ground deducted; lost much time by breakage of machinery; excavation good.
10		871.31	Sand, and some clay	No. 1 removed to head of false channel, and commenced work in clay; No. 3 broke dipper handle at 8.30 p. m. and stopped work.
11		420.48	Sand and clay, and fine sand	But two dredges at work; lost greater part of this day on account of high wind.
13		620.57	Soft clay and sand	But two dredges at work; crew disorganized, hence the work has been retarded.
14		900.30	Sand and clay	But two dredges commenced work; excavation good; crew disorganized; work progresses slowly; No. 1 stops work at 7 p. m. for want of men; No. 3 completes repairs at 7 p. m., and resumes work. All the dredges stopped at 12 p. m.

CONDENSED DAILY RECORD—Continued.

Date.	Hard material.	Soft material.	Quality of material	Remarks.
1858.	*Cubic yards.*	*Cubic yards.*		
Sept. 15		550.76	Loose sand and clay	Three dredges commenced work at 6 a. m.; No. 1 stopped work at 7 p. m.
16		505.00	Sand and clay	No. 1 works about 12 hours a day; excavation good; 1 p. m. high northwest wind; stopped work for the day.
17		200.33	do	At 10 a. m. all the dredges idle on account of high wind; no more work this day, excepting one dredge.
18		1,063.39	Fine sand and clay	Excavation fair and fine; No. 1 does not work during the night; much time lost on account of dredges being so far apart, and there being but five scows to three dredges; Nos. 2 and 3 still clearing up in south end of channel cut.
20		517.53	do	Much time lost on account of breakage of machinery and by reason of high wind.
21	30.00	610.65	Soft clay, clay and sand, sand	Tug-boat has to go to Little Lake George for fuel, which occasions much loss of time; No. 2 lost 6½ hours repairing; much time lost for want of scows to tend dredges.
22	86.00	666.20	Fine sand and clay, and some hard sand.	6½ a. m., No. 3 repaired and resumes work; No. 1 is still working only during the day.
23	90.00	492.77	Fine sand	Dredge No. 2 stopped 12 hours for repairs; excavation very fair.
24	73.00	625.54	do	Dredges stopped 6 hours this a. m. on account of wind.
25		886.61	Sand and clay	Excavation good; dredges stopped four hours each for scows this p. m.; tug-boat absent for fuel.
27		997.65	do	Excavation very good
28		857.41	Soft clay	No. 3 moved north to false channel; lost much time, the tug-boat being absent for wood.
29		956.98	Soft clay and sand	At noon fierce northwest wind, strongest gale of the season; dredges compelled to stop work until 7 p. m.
30		1,341.13	do	Beautiful day for dredging; all the dredges at work.
Total in Sept.	329.00	18,734.02		

APPENDIX D.

ST. MARY'S RIVER IMPROVEMENT,
October 18, 1858.

SIR: I have the honor to acknowledge the receipt of your communications of the 5th and 11th instant. They reached me simultaneously on the 17th instant. That of the 5th, relating to operations at the Neebish, of course, arrived too late to be effectual. Were it possible otherwise, the season is too far advanced to permit us to renew operations in that quarter this fall. The steamers design making but one more trip; hence we will be obliged to suspend operations about the 1st of November.

In regard to a point in your instructions, experience has taught me the necessity of dredging *deep* at the Neebish. A steamer passing *down* the rapids is obliged to carry a full head of steam in order to obtain steerage way; hence her own velocity, accelerated by the current, causes a great displacement of water. Thus the Northern Light, on her last trip down, (before our second dredging,) drawing *ten feet* water, just touched the 12 feet shoal at the lower end of the channel-cut. Another fact I note with respect to the Neebish. Tug-boats, passing *down stream*, cannot tow with safety more than one vessel, owing to the narrowness of the channel and the sharp turns necessary to be made. Towing two or three vessels, the rear vessel would swing (by the current) on to the reef. In ascending the difficulty is less. Therefore, to render the channel every way practicable, the full width of 300 feet should be attained, with a depth of 16 to 18 feet *throughout the entire width*, owing to the swinging of a long line of vessels.

With respect to the middle channel, Lake George, I have this day, agreeably to your instructions, ordered the dipper handles of dredges to be gauged at 18 feet. The dredges are at work on the 4th and 5th cuts, or on very nearly the 100 *feet range line*. I presume this line, to correspond with my large stations on shore, you regard as the practical or *running* line; therefore the deep dredging on that line will not be amiss. Assuming this line to be the central which you allude to—the centre of the 50 feet in width of 18 feet water—it will be necessary to redredge one cut on the east side, or change the range line; but before the resumption of operations in the spring, you will be able to decide definitely what portion of the 300 feet projected channel-cut the 50 feet space shall fill. I think the present range, as projected by your orders, is preferable, still you may choose to change it.

The 15th October was a remarkable day in our lean calendar. At 9 a. m., being on the Buffalo dredge, at the extreme southern end of the channel-cut, I observed a large steamer making for our channel. Presently she struck the ground much to the *westward* of the mouth of the natural channel, or Sturgeon reach She signalled for aid. I ran down with my small boat, and found the vessel to be the Northern Light, Captain John Spaulding. The captain stated that he was laden so deep that he could not pass through the east channel, and desired me to pilot him through the middle channel. I informed him

that I was not authorized to allow any vessel to pass. He replied that I must excuse him for his importunity and help him through. I finally consented to pilot him, provided he took all the risks of getting aground; he gladly assented to my terms. I sent for the St. Mary to pull him off, which was accomplished without trouble, and we passed triumphantly up the channel *without touching*, although the lumps were not all removed—although the channel-cut, at its junction with the natural channel, was scarce 70 feet wide, and we had to turn the point to get into it, (just as is shown on the map I sent you on the 30th of September.) *The getting into our channel-cut* with so long a steamer was the *ticklish* point, and our success proved, to my delight, that if we should be able to dredge a width of only 150 feet, according to my projection, vessels will have no sort of difficulty in passing; and should the work be completed the full width of 300 feet we would have a perfect channel. The Northern Light is one of the largest vessels navigating these waters, and was drawing 11 feet. Her career through the channel-cut was a *triumph;* she received hearty cheers as she passed the dredges. Captain Spaulding was *delighted*, and offered to remunerate me, but, of course, I declined.

You will doubtless hear of this transaction, and I communicate the facts to you so that you may properly understand them, and not impute to me the unjustifiable ambition of opening the channel without your sanction. Had you been on board *as pilot* my satisfaction would have been complete.

We are having much stormy weather, with rain. Nevertheless, the prevailing winds being north or south *with* the course of the channel, the dredges have been able to work more than they otherwise would have done; yet it is *very unpleasant* working at this season of the year. We have already excavated 12 to 14,000 yards.

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Very respectfully, your obedient servant,

J. H. FORSTER,
U. S. Sub-agent, St. Mary's River Improvement.

Capt. A. W. WHIPPLE,
Topographical Engineers.

APPENDIX I.

UNITED STATES SURVEYING STEAMER SEARCH,
Thunder Bay, Lake Huron, October 9, 1858.

SIR: In compliance with the "General Regulations of the Army of June 1, 1857, par. 1224," I have the honor to submit the following report of the progress during the past year, of the survey of the north and northwest lakes, together with an estimate of the amount required for the further prosecution of the work.

I shall adhere, in this report, to the plan adopted in the last annual

report as the one best calculated to show the character and progress of the work, of dividing it into the following heads:

I. Office work, including the reduction and engraving of charts.
II. Field operations of the current season.
III. Proposed plan of future operations, with estimates.

Office Work.

Under this head I shall confine myself to a brief summary of the work executed by the several parties in the office during the past winter and spring.

Off-shore hydrography. The soundings made by the steamer Search in the upper portion of Saginaw bay were projected, under my direction, by Assistants J. A. Potter and Wm. Casgrain, on a scale of $\frac{1}{40000}$, making a sheet 1,152 square inches of hydrography. This sheet proves the bay to have been well sounded, and delineates very clearly the several channels and shoals. Assistants Potter and Casgrain also drew an outline chart of the lower portion of the same bay, on a scale of $\frac{1}{100000}$, for use in the field this season.

Hydrography and Topography of Shore-line.

Assistant Hearding's party, consisting of Assistants J. Forster, J. Beghein, and O. M. Chaffee, projected their work of the preceding season on the following maps:

One sheet from Point aux Barques to the light-house .... scale $\frac{1}{16000}$
Two sheets from Point aux Barques to Oak Point ..... scale $\frac{1}{16000}$
One sheet of the Huana Kissee marsh ..... scale $\frac{1}{16000}$
One sheet of the Maumee river ..... scale $\frac{1}{10000}$
Part of the reduced chart of Maumee bay ..... scale $\frac{1}{30000}$

The above sheets in all included 2,024 square inches of minute topography and hydrography.

Assistant G. W. Lamson, together with Assistants D. F. Henry and A. Lamson, projected the following maps:

Four sheets of the shore-line of Saginaw bay, extending from Towas river to near the Pinnecawling river, each on a scale of $\frac{1}{16000}$.

One sheet middle channel St. Mary's river, scale $\frac{1}{16000}$. These several sheets included 3,156 square inches of topography and hydrography.

Assistant H. C. Penny, together with Assistant H. Gillman, projected their work in two sheets on a scale of $\frac{1}{16000}$, and included in them that portion of the shore-line of Saginaw bay from Sand Point to near the Huana Kissee marsh, and containing 2,511 square inches of topography and hydrography. The areas covered by these sheets and their location can be readily seen by an inspection of the sketch of Saginaw bay, accompanying this report, where the several sheets are included in the field-work of the several parties in 1857.

Primary Triangulation. Second Lieutenant O. M. Poe, Topographical Engineers, computed the reductions, for inclination of tubes, to

the base-line measurement; also, the approximate elevation of the base-line above the sea level by the comparison of four months' barometric observations at Land Point and Blackwell's island, New York, the latter having been furnished the survey through the courtesy of Jas. Green, esq., of New York, and Dr. Sanger of the island. Having obtained the final reduction of the base, Lieutenant Poe discussed and reduced the angles observed, and computed the sides of the triangles; and on being furnished with the latitude and longitude of the observatory at Land Point, computed the geodetic positions of all the points of the triangulation. In all or most of these computations he was assisted by Brevet Second Lieutenant W. P. Smith, Topographical Engineers.

Astronomical Computations. Second Lieutenant Turnbull, Topographical Engineers, and Assistant Jas. Carr, computed all the observations for latitude made at Sand Point with the zenith telescope. Lieutenant Turnbull having been withdrawn from the survey, temporarily, the observations for longitude made at the same place on the moon and moon culminating stars were placed by me for computation in the hands of Professor George B. Bond, of Cambridge observatory; and having transmitted a copy of these observations to the Bureau of Topographical Engineers, they were given for computation to Professor James Major of the Washington Observatory. I take this occasion to express the indebtedness of the survey to both these distinguished gentlemen for their accurate computations. A slight difference was found in the final result as reported by each, due to the relative weight given by them to the observations made at Greenwich with the alt-azimuth instrument.

Where corrections were given for the tabulated right ascension of the moon, by both the alt-azimuth and transit-circle, Professor Bond took the mean of the two corrections; Professor Major, on the other hand, only employed the corrections as given by the alt-azimuth on those nights when the moon was not observed with the transit-circle. In addition to this cause Professor Major's result was affected by the introduction of three comparisons with corresponding observations made at the Washington Observatory. A mean of both results was taken as the longitude of the observatory. In the Appendix A will be found the report of Second Lieutenant Turnbull, giving the final result both for latitude and longitude of the observatory, which quantities are latitude 43° 54′ 49″.79 north, and longitude 5*h*. 33*m*. 22*s*.976 west of Greenwich.

It was my anxious desire in the spring, before taking the field, to obtain the longitude of the observatory at Detroit, by telegraphic connexion with some well determined observatory. The instruments, however, designed to be employed in this operation not arriving in time, the projeet had to be postponed to a more favorable period, which I am in hopes will be early in the coming winter.

Reduction and engraving of the final charts.

Since my last report there have been reduced and transmitted to the bureau for engraving the following charts:

Charts the data for which have been obtained in the field.

Thunder bay and Harbor of Refuge.

Harbors of Presque Isle, False Presque Isle, and Middle island, Lake Huron.

Of the published charts there have been, during the past year, distributed gratuitously to owners and masters of vessels, applying at the office in Detroit, 1,674 copies of the different charts. The practice has recently been adopted, having been sanctioned by the Bureau of Topographical Engineers, of issuing the charts to the vessel or owner, and not to the master, as has been the custom previously. This practice was adopted owing to the frequent renewal of application from the same vessel for charts, on the ground of change of master. It has also been found necessary to require applicants for charts to produce the custom-house papers belonging to the vessel as evidence of its existence, there having been good reasons to believe that charts had been drawn in the name of vessels that could not afterwards be ascertained had any real existence. The demand for these charts continues very great. Daily applications are made at the office, requiring the services of one assistant to meet them, and rendering it extremely difficult to have the charts printed as rapidly as they are issued. I have, in a special report to the bureau, recommended that a nominal price be put upon these charts, just sufficient to cover the cost of paper and printing, and the experiment tried of ascertaining if, after the government has once encountered the heavy outlay of collecting the data and engraving the chart, whether they cannot be made to pay for the printing by selling them. I am quite satisfied, from my experience, that such an arrangement would be perfectly satisfactory to those who really appreciate these charts and want them for use.

The foregoing is a succinct account of the work executed in the office during the past year. The force retained during the winter, on account of their special knowledge and services, were actively employed in repairs and alterations to the camp equipage, steamers, boats, &c., and such other matters requiring attention preparatory to resuming the field work; also in affording the usual attendance on the offices, the observatory, and as watchmen on the steamers and at the public warehouse where the property belonging to the work is stored for the winter.

Field operations of the present season.

Prior to taking the field, a projet of operations was submitted to and approved by the bureau, embracing in general terms the extension of the survey of Saginaw bay, to include the whole of Lake Huron. This plan was deemed more consistent with judicious economy than to complete the survey of Saginaw bay with a portion of the force, and detach the remainder to a more distant field.

So soon as the character of the season justified, six parties were organized as follows:

Off-shore—hydrography, primary triangulations, astronomical and

magnetic observations, and three for the shore-line topography and hydrography. The results produced by each of these parties, to include the 30th of September, will be briefly recapitulated in succession.

Off-shore hydrography.—This portion of the work was directed by myself, on the steamer Search. It was selected for my personal share of the work in consequence of its affording me freer movement, thus enabling me to discharge the duties of superintendent and disbursing agent.

The steamer was placed in commission towards the close of April. The first duty performed was the search for, and discovery of, a shoal near Middle Island, Lake Erie, the existence of which had been reported to the office. The necesary examinations were made, the work connected with the survey of Lake Erie, and this shoal is now placed on the published charts of this section.

After executing the above duty, the steamer proceeded to Lake George, St. Mary's river, leaving on the way a topographical party at Thunder bay, the Department of War having placed me on Board of Engineers to examine the channels of that lake. The board were occupied several days in making the required examinations, and in drawing up the report, in which duty the steamer and party on board rendered valuable aid.

An experiment was then made to get a view over one of the lines of the large triangle projected by Capt. J. N. Macomb, Topographical Engineers, for the correction of the survey of St. Mary's river. I regret, however, to report the experiment was not successful, the flash of a heliotrope at one station not being visible from the other. After visiting Taquamenon bay, Lake Superior, to withdraw from thence some public property belonging to the survey, the steamer returned to Detroit and was occupied for some weeks placing parties in the field and erecting stations for the triangulation of Saginaw bay. Early in June the deep soundings of Saginaw bay were commenced and continued till the whole bay had been sounded. The work was also extended to the Lake Huron shores, some fifteen miles above Saginaw bay, and some forty-five miles below, as far as Forestville. Thunder bay, also, with adjacent portions of the Lake Huron coast has been sounded out.

In the Appendix B. No. 1 will be found a summary of the steamer's work. Over 1,500 square miles of hydrography have been executed, requiring 2,378 miles of lines to be sounded.

The soundings are of sufficiently minute a character to preclude the possibility of any obstacles to navigation escaping the lead. They have been carried out to an average distance from the shore of nine miles, and to an average depth of thirty fathoms, commencing at the four fathoms curve, to which the work of the shore parties is limited. In addition to the work of sounding above reported, the steamer has been employed in transferring chronometers for differences of longitude, in visiting and moving parties, and in various other duties, requiring it to have run, as will be seen by the statement in the Appendix B. No. 1, from April 25 to September 30, over

8,000 miles in all; evidence of the active manner it has been employed. My assistants in the above duties have been for the whole time Assistant J. A. Potter, and for portions of the time Assistant D. F. Henry and O. M. Chaffe. My thanks are due to each of these gentlemen for the efficient manner they have aided me in the work.

Primary Triangulation.—This branch of the survey was placed under the charge of 2d Lieutenant O. M. Poe, Topographical Engineers, assisted by Brevet 2d Lieutenant W. P. Smith, Topographical Engineers. In order to extend the triangulation of Saginaw bay to include the line Point au Sable, Point aux Barques, it was found necessary to erect stations at each of these points, of greater altitude than had ever before been attempted on the survey—the estimated distance between these points being over twenty-seven miles. Lieutenant Poe was therefore directed to erect at Point aux Barques a station upon a plan suggested by himself, having a centre post of 100 feet in height, on which the instrument stood, surrounded by a platform for the observer—the platform being sustained by a pyramidical framework, distinct and not touching the centre post. The novelty of this design consisted in the centre post, which was composed of four sticks of timber, scarfed to make the whole length, forming a rectangular pyramid of eight feet base, and coming together at the top so as to form one post. These were braced together on the four sides by horizontal and diagonal braces, in sections arranged in such a manner that the diagonals crossed at right angles. The whole post was then additionally braced by two sets of braces, one from the ground resting against the post fifty feet from the bottom—the other resting against the post seventy-five feet from the bottom, with the feet set into the lower braces. The platform pyramid was carried up above the platform to its vertex, 36 feet in height and surmounted by a pole with a Sand's heliotrope, which stood 169 feet above the water level.

Lieutenant Poe, at Point au Sable, erected a station upon a plan devised by myself, with a centre post of 82 feet in height. The plan was similar to the one heretofore used upon the survey, except in the idea of splicing the centre post and adding a set of braces, which, butting against the top of the post, rested on the next set below.

I have been thus minute in describing these stations because I am not aware that lines of sight for a triangulation, by artificial structures of wood, have ever been secured over as great distances as we have succeeded in effecting in Saginaw bay.

Lieutenant Poe, having successfully erected both these stations, was unfortunately attacked with serious illness just as he was preparing to commence observing. The condition of his health requiring his withdrawal from active duty, I assigned assistant James Carr to the charge of the triangulation. Assistant Carr was furnished with a 10-inch repeating theodolite, by Gambey, and a new 10-inch theodolite, by Wurdemann, both being repeating instruments and of superior character.

Owing to the difficulty experienced of obtaining satisfactory observations over lines of such great length, across water, assistant Carr was

occupied during the whole balance of the season in completing the few triangles of Saginaw bay, not obtained the previous year, he having heliotropes of the most approved pattern, flashed from each station between which the angle was required. Appendix B No. 2 contains the amount of work executed by Assistant Carr to September 30. It was found impracticable to extend the triangulation beyond the line, "Point au Sable," "Point aux Barques," owing to the character of the shores of Lake Huron.

From Point aux Barques to the head of the St. Clair river the coast is comparatively straight, flat, and densely wooded, with a few scattering settlements on the immediate banks of the lake. To attempt to carry a triangulation of any proportions along this coast would have involved the cutting out of almost every line of sight throughout its whole length, and erection of stations of maximum elevations at each point. This would have required the labor of years, and consumed very nearly the whole appropriation for the survey. Such considerations, of course, precluded any such attempt. Under the circumstances it was determined to connect the survey of the shore-line by such minor triangulations as the character of the ground permitted, and to establish astronomical bases, by selecting points at convenient distances, the latitude of which should be determined with the utmost precision, and their differences of longitude with the principal meridian at Sand Point observed with all the accuracy the instruments furnished the survey rendered practicable.

In pursuance of this plan a base will be measured in the vicinity of the head of the St. Clair river, and a triangulation carried from thence up Lake Huron as far as the approachment of the Canadian shore will admit of lines of sight. An astronomical station has been established at Fort Gratiot and at Forrestville, and some intermediate point between Forrestville and Point aux Barques will also be selected hereafter. To the northward of Saginaw bay the character of the coast is more favorable.

In Thunder bay a triangulation of good proportions is attainable, which can be carried by means of Middle island as far as False Presque Isle. To connect this triangulation with that of Saginaw bay, an intermediate station has been astronomically occupied at Sturgeon Point, from which point both Point au Sable of the Saginaw triangulation and Thunder Bay island are visible. A station of maximum elevation being erected at Sturgeon Point, the azimuth from Point au Sable (25 miles distant) is obtained by direct observation, and the latitude being observed. The longitude from the principal meridian at Sand Point is deduced by computation from the data above and assumed proportions of the earth as to sphericity. In the same manner a transfer is effected to the station at Thunder Bay island, (distant from Sturgeon Point 25 miles;) and there is every reason to believe the process can be extended to Presque Isle, 30 miles beyond, and possibly to near Station Mast, the last station of the Straits of Mackinac work. As a further test, the difference of longitude between the principal meridian at Sand Point and the station at Thunder Bay island has been carefully obtained by exchange of chronometers.

The triangulation of Thunder bay has been commenced by Assistant G. W. Lamson. A base of over two miles in length, over favorable ground, has been selected and the line of sight opened. Stations had been erected at most of the points when Assistant Lamson's party was broken up, in consequence of a fever appearing in his camp assuming an epidemic form. Assistant Lamson, however, will return to the field with another party, organized on board the steamer Surveyor, and it is expected that he will complete the preliminary measurement of the base line, with the wooden rod apparatus belonging to the survey, and that he will be enabled to observe all the angles necessary to extend the triangulation above the Thunder Bay islands, connecting with Assistant Penny. The triangulation above and below Middle island has been executed by Assistant H. C. Penny, from a preliminary base measured on the main shore, abreast of Middle island.

Along that portion of the coast extending from Sturgeon Point to Thunder bay there are appearances of a broken and elevated country some distance inland, presumed to be the dividing ridges between the waters of Black, Devil, and Thunder bay rivers. This section of country is a perfect wilderness, of which little seems known, at least it has not been found practicable to obtain any definite information in regard to it. Circumstances have prevented a reconnaissance being made of this section this season, as a proper reconnaissance will, from its wild character, be the work of both time and money. It is my purpose, however, to have such an examination made as I am led to hope, from what I have seen, that there is a probability that the Saginaw triangulation by means of this elevated region, may be extended over Thunder bay, and possibly by means of elevations reported near Presque Isle, be connected with the triangulation of the Straits of Mackinaw. In the meantime, until this question can be solved, the methods above described have been resorted to, which, though wanting in the extreme precision of a great triangulation, are yet sufficiently accurate for the practical purpose of producing charts of great value to navigators, by whom they are so eagerly and unceasingly sought.

Astronomical Observations.

The foregoing account of the triangulation will afford some insight into the astronomical operations of the season. In order to carry out the plan there referred to, Lieutenant Turnbull, Topographical Engineers, assisted by Assistant James Carr, was, early in June, placed in position at Forestville, Lake Huron.

Lieutenant Turnbull was furnished with a new transit, by Wurdeman, and a new zenith telescope, by the same maker, four sidereal chronometers and an electric clock and chronograph, made by William Bond & Sons, of Boston. It is not deemed necessary to give a minute description of the chronograph with the *spring governor*, as desired by that distinguished astronomer Professor W. C. Bond, director of the Cambridge Observatory. This will be found in detail in several

scientific works, particularly in the reports of the United States Coast Survey. I feel justified, however, in bearing testimony to the simplicity and accuracy of the working of the instrument and its adaptability to field work. The clock and chronograph have this season been set apart four different stations, requiring no more care in their adjustment and handling than should be given to any instrument having pretensions to delicacy. Lieutenant Turnbull and myself, by the authority of the War Department, visited Boston early last spring to receive these instruments and be instructed in their management and use. It affords me great pleasure to take this opportunity of returning the thanks of Lieutenant Turnbull and myself to Professor Bond and his sons for their kindness and courtesy so liberally extended towards us on this occasion.

At Forestville, Lieutenant Turnbull determined the latitude by observations with the zenith telescope, and made such observations for longitude as his length of stay and the character of the weather permitted. The absolute difference of longitude between the station at Forestville and the principal meridian at Land Point was made by the careful exchange of the four chronometers twelve times between each station, the clock remaining in position at Forestville, rated by the observations there. The results of the several comparisons accorded very well with each other.

After completing the observations at Forestville, Lieutenant Turnbull was transferred to Thunder Bay island, the latitude and difference of longitude of which was determined in a manner precisely similar to the Forestville station.

Sturgeon Point, a station intermediate between Thunder Bay island and Point au Sable, was next occupied by Lieutenant Turnbull, at which position the latitude and true meridian were determined. The last point occupied by Lieutenant Turnbull is in the vicinity of Fort Gratiot, at the head of the Saint Clair river, where, it is expected, before the close of the season, he will have determined the latitude and the difference of longitude with the Forestville station. He will also make such observations on the moon and moon culminating stars for the absolute longitude of the station as the weather during his stay will permit.

The season has been, on the whole, favorable for astronomical observations, as will be seen in the abstract of Lieutenant Turnbull's work, contained in the Appendix, (B, No. 3.)

In executing this duty after the withdrawal of Assistant Carr, Lieutenant Turnbull was assisted by Brevet Second Lieutenant W. P. Smith, Topographical Engineers.

Magnetic Observations.

Lieutenant Turnbull having reported that his duties as chief of the astronomical party prevented (from want of time) his making the magnetic observations, I assigned Brevet Second Lieutenant W. P. Smith to his party for the special purpose of attending to this duty. This was done prior to the transfer of Assistant Carr; afterwards

Lieutenant Smith discharged the duty of assistant to the astronomical party, and at the same time observed with the magnetic instruments. These instruments were a portable declinometer, with detached theodolite for the determination of the declination and magnetic intensity—made by Jones, of London—and a dip-circle, by Barrow. Both these instruments were new, having been recently imported. The declinometer, from the delicacy of its construction and the sensitiveness of its magnets, is more calculated for a fixed observatory than for field observations. It was originally designed to furnish the party in the field with a Fox dip-circle, an instrument portable and easily manipulated, with which the magnetic elements can be readily obtained with a degree of accuracy sufficient for the purposes of the survey. Such an instrument was ordered, but had not been received on taking the field. It is intended on its arrival to confine the observations with the declinometer to the Detroit observatory, and to compare with it, before going into and on returning from the field, the Fox dip, so that the observations made with the latter instrument for the intensity, and which are only comparative, may be reduced, and the exact intensities ascertained.

The absolute magnetic elements have been obtained by Lieutenant Smith at the four astronomical stations, and it is expected he will occupy several more points before the close of the season.

I feel it due to Lieutenant Smith to bear testimony to his zeal and energy, and to the commendable perseverance with which he overcame all the difficulties of the declinometer—an instrument of not very easy manipulation to an experienced observer, and taxing exceedingly the patience. An abstract of Lieutenant Smith's work will be found in the Appendix, marked B, No. 4.

Shore-line Topography and Hydrography.

Three parties for this duty were organized early in the spring, and posted in succession on the shores of Lake Huron. The first under the charge of Assistant G. W. Lamson, having as assistants Messrs. D. F. Henry and A. Lamson, left Detroit on the 8th of May, and were placed in camp at Thunder bay. Assistant Lamson was directed to commence the survey of Thunder bay, some four miles above the light-house, and to extend his work to the south, embracing in his hydrography the four fathom curve. He was also directed to make examinations for a base line, and the projective of a scheme of triangles extending therefrom. Up to this date Assistant Lamson has executed the survey as above directed, embracing an extent of fifty-three miles of shore-line, and had selected the ground for a base, and commenced the triangulation when his party was broken up by sickness, as mentioned in a previous part of the report. Appendix B, No. 5, contains the reported details of Assistant Lamson's work for the season, which may be briefly stated as 100 square miles of topography and hydrography, and 812 miles of lines of soundings. The survey of Assistant Lamson has developed the existence of several very commodious and secure harbors of refuge in and around Thunder bay,

and proves this estuary to be of much more value and importance than was before generally known. Thunder Bay river was found to have a practicable channel of seven feet of water. All these facts it is of the highest importance to make public, for though they are not claimed as discoveries, being mostly known to a few fishermen and coasters, yet the knowledge of them is confined to this limited class, whereas their publication through the charts of the survey will make them extensively known, rendering them of great value to vessels passing along the coast the main channel of communication between Buffalo and Chicago.

The second party placed in the field was under the charge of Assistant W. H. Hearding, and consisted, besides himself, of Assistants J. C. Beghein and O. N. Chaffee. Assistant Hearding was directed to resume the survey of the Lake Huron shore at the point near Point aux Barques light-house where it terminated the year previous, and to extend the same in the direction of the St. Clair river. At the present date, Assistant Hearding has reached within twenty-three miles of the river, having surveyed over fifty-one miles of the shore, and included in his work sixty-five square miles of hydrography, and twenty-eight square miles of topography. This survey includes many settlements rapidly growing into importance, such as Lexington, Bark Shanty, Forestville, &c., &c. Assistant Hearding reports many portions of this coast as steep and rocky, and in places so precipitous that no landing could be found for small boats for miles. Appendix B, No. 6, contains the general summary of Assistant Hearding's work. It is due to this party to state that Assistant O. N. Chaffee was withdrawn for one month to assist in the off-shore hydrography.

The third party in the field was placed at Presque Isle, Lake Huron, under the charge of Assistant H. C. Penny, with Assistants H. Gillman and William Casgrain. Assistant Penny commenced, about the 14th of May, the survey of the shore of Lake Huron some five miles above Presque Isle, and extended it south till he connected at Thunder bay with the work of Assistant Lamson, which junction was effected early in August. He was then transferred to the vicinity of the Sable river, and, resuming the work of 1856, extended towards the north till a junction was effected with Assistant Lamson's work at Thunder bay. This Assistant Penny has already effected, thus completing, in conjunction with the other parties, the survey of Lake Huron from above Presque Isle to within twenty-three miles of the St. Clair river. Assistant Penny measured a secondary base-line on the main shore opposite Middle island, and extended from it such triangulation as the character of the ground permitted, from Thunder bay to Presque Isle. This part of the work includes the harbors of refuge of Middle island, False Presque Isle, and Presque Isle, all of which have been minutely sounded and the data obtained for charts of the same, making public and available their capacity, channels, &c. Appendix B, No. 7, is a statement of Assistant Penny's work of the season, showing a survey of 72½ miles of shore-line, 118 square miles of hydrography, and 1,449 miles of lines sounded.

Justice to Assistant Penny requires that attention should be called

to the fact, that the amount of work executed by his party largely exceeds the amounts of the other two topographical parties of equal strength with his, and no more favorably situated in regard to obstacles encountered. Assistant Penny's party, it is hoped, will be enabled before the season closes to erect the first class stations required at Sturgeon Point and Thunder Bay island.

Water level and meteorological observations.

In the last annual report, the attention of the bureau was called to the necessity of making a series of observations on the rise and fall of the water level of the several lakes; in order to ascertain, if possible, the laws of their fluctuation and their causes, it was recommended that these observations should be accompanied by meteorological observations. A special item was therefore introduced into the estimate for the pay of observers and the purchase of necessary instruments. Delay in the action of Congress on the appropriation bills induced an application to the bureau for the purchase of the instruments from the general fund for "the purchase and repair of instruments." This requisition being promptly approved, orders were immediately given for such of the required instruments as could be purchased of makers, and application made to the United States Coast Survey for permission to have constructed in that office, or under its supervision, four self-registering gauges upon the ingenious plan devised by Mr. Saxton, of that work. It affords me great pleasure to state, that this call upon the United States Coast Survey was promptly responded to with the courtesy and liberality which is characteristic of the distinguished Superintendent of this great work. Two of the gauges were made in the Office of the Coast Survey and the other two by competent mechanicians, under the supervision of that office. The meteorological instruments were ordered by James Green, of New York, whose character for excellence in this department is a guaranty of their value. The necessary time to produce these instruments after the orders were given produced so much delay that they arrived late in August. It was too late for me to visit all the points designed to be occupied to set up the instruments and instruct the observers. Operations, therefore, in this department of the survey, have this season been confined to Lake Huron, in the vicinity of the other work being carried on. Fort Gratiot, Forrestville, Point aux Barques, Towas Point, Thunder Bay islands, and Presque Isle have all had water gauges set up and observations made four times a day, which observations will be continued as long as ice is not formed. At Thunder Bay island a self-registering gauge has been set up and is in successful operation. This station has also been supplied with meteorological instruments, consisting of barometer, psychrometer, thermometer, and rain gauge. Similar instruments are furnished Point Towas and Fort Gratiot. Great care is taken, in setting up the instruments, that they are subjected to the proper exposure, are correctly adjusted, and the observers duly instructed in their management and mode of observations. Printed

forms are furnished, in which the daily observations are recorded for a month, when the results are transmitted to the office at Detroit. In the forms are columns for observations on the wind, clouds, &c., &c.

Whenever a sufficient number of these observations at numerous points are accumulated, they will be placed in the hands of a distinguished meteorologist for discussion, and the production of such results as may be deducible from them.

Recapitulation of Field Operations.

From the foregoing report it will be seen that the off-shore hydrography of Saginaw bay has this season been completed, also that of Thunder bay; and in addition, a considerable portion of the off-shore hydrography of Lake Huron. That the primary triangulation of Saginaw bay has been finished, also a triangulation extended over Thunder bay, and from thence to False Presque Isle; that four points have been occupied astronomically and the dates ascertained for four astronomical bases, the latitudes and longitudes being observed at each point; that the hydrography and topography (to the four fathom curve) of the shore of Lake Huron has been executed for 177 miles of its length; in other words, the data obtained for the final charts of Saginaw bay, Thunder bay, the harbor of Presque Isle, False Presque Isle, and Middle island, and leaving but little to complete the data for the final chart of the Lake Huron coast within the limits of the United States.

Plan of Future Operations and Estimate.

In submitting an estimate to be laid before Congress, it is imperative to assume in advance the scene of future operations. It has already been reported that the survey of Lake Huron is this season nearly completed, and that it will require next season but a small portion of the existing force to bring it to a close. In any plan of future operations the completion of Lake Huron will, of course, be included. That portion of the force not required for this purpose is, however, available for another field. So far as I am informed of the wants of navigation, there are two portions of the lake region yet unsurveyed that require immediate attention. These are Lake Superior and the north end of Lake Michigan. No one can be ignorant of the importance and urgent necessity of an accurate chart of Lake Superior who is at all familiar with the increasing trade and commerce of this inland sea, or has an idea of the uncertainty and danger attending its navigation. At the same time the Fox and Manitou islands, and the navigable channels between them in the north end of Lake Michigan, should be surveyed and their dangers made known. So little is now known of this region, that only recently a notice appeared in the shipping intelligence of the public journals wherein a vessel acknowledged passing another ashore at the Fox islands with the signals of distress unrelieved, for the reason that, being ignorant of the shoals, the passing vessel was fearful of involving itself in danger.

Such a confession could not be publicly made if correct charts of this region were published. I am therefore extremely anxious to extend the survey, already carried to the Beaver islands, to the Fox and Manitous, and to embrace in it a survey of Green Bay and its approaches. But in my last report I submitted an estimate containing the amount required to carry the survey on in one lake region, together with the additional sums necessary to carry it on simultaneously on other lakes. Congress was pleased to appropriate the amount designated in the estimates as necessary to carry the survey on in one lake, but at the same time required that Lake Superior should be included, the words of the act being: "For continuing the survey of the northern and northwestern lakes, including Lake Superior." I therefore consider that if a change in the scene of operations is to be made, that in view of the expression of the will of Congress, Lake Superior should be selected. The estimate is accordingly based upon this view; but as the survey of Lake Huron requires to be finished, I have estimated for a force, with equipment and supplies, sufficient for both duties. This causes the amount to be somewhat larger than the amount appropriated for the current fiscal year, but will, I trust, be granted, in view of the absolute necessity of having operations carried on in two lakes at the same time.

If it should be the pleasure of Congress to extend the survey in Lake Michigan, an appropriation of $50,000 would enable the work to be vigorously prosecuted there. As to submitting an estimate predicated on an extension of the work to proportions such as legitimately it should possess, past experience would seem to forbid. For years past the annual reports from this office have contained arguments setting forth the expediency and necessity of larger appropriations. It has been shown that true economy was promoted by liberal appropriations, and that the production of results was in a much greater ratio than the amount appropriated, due to the fact that certain necessary expenditures are common to a small and larger organization. I do not deem it necessary to burden this report with a long array of statistics of the growing commerce of the lakes and a list of disasters to vessels, with the losses of life and property consequent therefrom. These are facts which should be, and I take it for granted are, familiar to every person who studies the history and progress of the lake region. The difficulty appears to be in rendering apparent to those who are interested in the commercial prosperity of the lakes, the intimate connexion between this prosperity and correct charts. I cannot but believe, if this connexion were clearly understood, that public sentiment, expressed through the representatives and senators in Congress, would demand and receive appropriations on a much larger scale than are now or have for some time past been made. I consider my duty is confined to making known the fact, which I have done, that economy and a judicious expenditure of the public money requires larger means than have heretofore been granted. If it is the settled policy of the government to continue to completion the survey of the lakes, there is nothing gained by hampering its progress by inadequate means. The work is one essentially of time, and the time required is based directly upon the means furnished. There is no

reason that Lake Superior and Lake Michigan should not be both surveyed at the same time, except that to do so would require, 1st, double the number of boats, persons, instruments, &c., and cost just double the amount for paying the persons and purchasing the boats, instruments, &c. The work of five years, with the existing organization, can be done in one year, with five times the means supplied as are now given, and so on. It remains for Congress alone to determine the progress of the work and the time required for its completion. I consider that I have discharged my duty when I have stated the reasons that influence me, the officer in charge of the work, to believe that the interests of the work, and through the work of the country, would be greatly advanced by the more rapid prosecution of it, and more numerous results produced were larger grants of public moneys to be made.

Very respectfully, your obedient servant,

G. G. MEADE, *Cap. Top. Engs.*

Colonel J. J. ABERT,
Corps of Topographical Engineers, Washington, D. C.

APPENDIX A.

Annual Report of the Survey of the Northern and Northwestern Lakes, 1858.

OFFICE OF THE UNITED STATES LAKE SURVEY,
Detroit, April 17, 1858.

SIR: I have the honor to transmit herewith the accompanying papers, showing the results of the observations for latitude and longitude made at station "Sand Point," Saginaw bay, Lake Huron.

These observations were made by myself, with a twenty-six inch zenith telescope, made by Wm. Würdemann, Washington, D. C., and a thirty-two inch transit of English manufacture; no name on the telescope.

The computations for latitude were made by myself and Mr. James Carr, assistant to the astronomical party.

Table "A" shows the means of the latitude by each night's observations, the final mean, the probable error of a single observation, the probable error of the mean of the results for a single night, and the weight of the mean of each night.

The final mean 43° 54′ 39″.79 N. which has been adopted as the latitude of the station, is deduced from the means of each night, giving to each the weight due to the number of pairs observed on and to each equal value.

The probable error of a single observation is deduced from the formula.

$$r = o.\ 845447 \frac{\Sigma\ (x - n)}{\mathrm{L}\ m\,(m - 1)},$$

in which $\Sigma\ (x - n)$ is the sum of the differences of each observation from the mean for the night, and in the number of observations. This formula is taken from the Astronomische Nachrichter.

The probable error of the mean of the results for a single night is obtained from the formula $\frac{r}{\sqrt{m}}$ r and m respecting the same quantities as in the preceding formula.

The weight of the mean of each night is obtained from the formula $W = 2\frac{m}{\Sigma (x-n)^2}$ in which m is the number of observations, and $2\,\Sigma\,(x-n)^2$ is twice the sum of the squares of the differences of each observation from the mean for the night. R, the probable error of the final result, is obtained from the formula $R = \frac{\odot 47\ 693}{\nu\,\Sigma\,(W)}$. Σ (W) equal the sum of the weights for the mean of each night.

The observations for longitude were submitted to Professors G. P. Bond and James Major for computation. Table "B" shows the results of the computations.

The differences in the results for any night arise from Professor Bond's having given equal weight to the corrections, to be applied to the tabulated A.R. of the moon, deduced from the observations with the alt-azimuth and transit-circle to reduce it to the results of actual observations at Greenwich, and interpolating for the moon's place from the quantities given in the American and British Nautical Almanacs, while Professor Major confined himself to the British Nautical Almanac and gave preference to the corrections deduced from actual observations with the transit circle at Greenwich, only using those deduced from the alt-azimuth observations on the night when no observations were made with the transit-circle; also by comparing three of the observations with corresponding ones made at Washington, which enter into his results.

I have taken the mean of Professor Bond's computations by interpolations from the American and British Nautical Almanacs as his result, and whenever Professor Major has a comparison with observations at Washington and Greenwich, the mean of the two is taken as the result of that night's observations.

The final result, 5*h*. 33*m*. 22*s*.976, or 83° 20′ 44″.64 west from Greenwich, adopted as the longitude of station "Sand Point," is the mean of the two computations; it differs by less than 1*s*. from either, which has been considered very nearly the ultimate limit of accuracy attainable in the determination of longitude by moon culminations, though their number be increased indefinitely, and the greatest possible care is given to the computations.

The probable error of the final result ± 1*s*.1 is deduced from the formula $r = \frac{\rho}{\nu\,n}$. in which ρ is the probable error of any one result and n the number.

Very respectfully, your obedient servant,

CHARLES N. TURNBULL,
2d Lieutenant Topographical Engineers.

GEO. G. MEADE,
Captain Topographical Engineers,
Superintendant United States Lake Survey.

TABLE A.

Latitude of the United States Lake Survey station, Sand Point, Saginaw bay.

GENERAL RESULTS.

Date.	No. of pairs observed.	Mean latitude for each night.	Probable error of a single observation.	Probable error of the mean of the results for a single night.	Weight of the mean each night.
1857.		° ′ ″	″	″	
July 9	9	43 54 40.53	0.98	0.33	0.278
11	10	39.67	1.49	0.47	0.114
12	9	39.03	0.94	0.31	0.347
13	10	39.22	1.89	0.59	0.069
16	10	39.72	1.67	0.53	0.107
24	14	39.70	1.55	0.41	0.089
25	11	39.14	1.52	0.45	0.082
26	10	38.99	1.62	0.51	0.093
31	12	39.90	1.39	0.40	0.115
Aug. 2	8	38.31	1.78	0.63	0.100
13	22	40.93	1.99	0.42	0.065
15	4	40.39	2.98	1.49	0.037
17	8	40.46	1.42	0.50	0.157
18	7	40.81	0.96	0.36	0.316
19	22	39.55	1.34	0.28	0.115
Means	.....	43 54 39.79	1.56	0.51	$\Sigma W = 2.082$

TABLE B.

Longitude of United States Lake Survey station, Sand Point, Saginaw bay.

FINAL RESULTS.

Date.	Moon's limb observed.	Resulting longitude as deduced by Prof. G. P. Bond.	Resulting longitude as deduced by Prof. James Major.	Means.
1857.		h. m. s.	h. m. s.	h. m. s.
July 2	I.	5 33 12.825	5 33 12.720	5 33 12.772
6	I.	01.455	02.390	01.922
7	II.	31.220	32.172	31.696
8	II.	24.570	24.134	24.352
9	II.	30.680	36.545	33.612
10	II.	24.660	23.526	24.093
31	I.	18.540	16.730	17.635
Aug. 2	I.	16.050	17.364	16.707
4	I.	25.175	26.034	25.604
5	II.	24.840	23.765	24.302
6	II.	15.135	18.743	16.939
8	II.	26.285	28.025	27.155
30	I.	11.770	15.200	13.485
31	I.	18.450	22.820	20.635
Sept. 1	I.	24.675	24.248	24.461
2	I.	24.055	23.370	23.712
3	I.	12.365	12.103	12.234
4	II.	43.180	46.537	44.858
5	II.	40.145	46.748	43.446
6	II.	31.785	35.106	33.445
26	I.	22.335	25.832	24.083
28	I.	23.255	*28.848	26.051
30	I.	22.505	*25.530	24.017
Oct. 2	I.	21.840	20.775	21.307
6	II.	20.520	*24.803	22.661
7	II.	10.605	12.485	11.545
8	II.	18.220	17.045	17.632
Means	----------	5 33 22.116	5 33 23.836	5 33 22.976

Final result Sand Point, west from Greenwich:

5*h.* 33*m.* 22*s.* 976 = 83° 20′ 44″. 64 —
Probable error of final result ± 1 *s.* 1.

NOTE.—The results in the column deduced by Professor G. P. Bond are the means by interpolation from the British Nautical Almanac and the American Nautical Almanac. The results marked with an asterisk are the means from comparisons with actual observations at Greenwich and Washington Observatories.

Appendix B No. 1.

Abstract of work executed by the party on board the steamer Search, during the season of 1858.

2,378 miles of deep sea soundings.
239 lines of soundings.
1,229 sextant angles for position of steamer.
3,744 readings of theodolite.
8,003 miles run by steamer on general duty other than sounding.
The necessary stations erected at different points for occupation and sounding stations.

Appendix B No. 2.

Abstract of work executed by the triangulation party in charge of Asst. James Carr, during the season of 1858.

500 square miles triangulated.
12 stations occupied.
18 triangles observed.
51 angles observed.
614 readings of theodolite.
1,343 repetitions of angles.
2,686 pointings of theodolite.

Appendix B No. 3.

Abstract of work done by the astronomical party under the charge of Lieutenant C. N. Turnbull, Topographical Engineers, during the season of 1858.

576 observations with transit on stars for time and errors of instrument.
24 observations transit of moon and moon culminating stars for longitude.
385 pairs of stars, observed with zenith telescope for latitude.
128 observations on circum-polar stars for value of micrometer,
12 transfers of four chronometers for difference of longitude.
Barometrical and meteorological observations four times daily for three and a half months.

Appendix B No. 4.

Abstract of work executed by the magnetic party in charge of Brevet Second Lieutenant W. Proctor Smith, Topographical Engineers, during the season of 1858.

2,540 vibrations of magnets.
236 angles of deflection.
280 angles of inclination.
15 angles of declination.
14 observations (half hourly) for declination.

12 observations for co-efficient of torsion.
10 observations for zero of magnet scale.
22 observations for angular value of magnet scale.

Appendix B No. 5.

Abstract of work executed by the party under the charge of Assistant G. W. Lamson during the season of 1858.

73¾	square miles of hydrography.
26	square miles of topography.
53	miles of shore-line traced.
963	lines of soundings.
812¼	miles of soundings.
30,793	casts of the lead.
4,588	theodolite pointings.
456	sextant angles.
9	observations for true meridian.
19	triangulation stations built.
101	sounding stations built.
214	buoys placed and located.

Appendix B No. 6.

Abstract of work executed by the party under the charge of Assistant W. H. Hearding during the season of 1858.

64·8	square miles hydrography surveyed.
28	square miles topography of villages and other improvements.
51⅞	miles shore-line surveyed.
918¾	miles of soundings.
996	lines of soundings.
33,089	casts of the lead.
4,652	theodolite readings.
11	sextant angles.
7	observations for true meridian.
17	light stations built.
133	sounding stations built.
185	buoys placed and located.

Appendix B No. 7.

Abstract of work executed by the party under the charge of Assistant Henry C. Penny during the season of 1858.

118	square miles of hydrography.
20	square miles of topography.
72½	miles of shore-line traced.
1,186	lines sounded.
1,449	miles of lines sounded.
60,778	casts of the lead.
3,144	theodolite pointings.

127 sextant angles.
8 observations for true meridian.
11 triangulation stations built.
104 sounding stations built.
171 buoys placed and located.

APPENDIX C.

ANNUAL REPORT, SURVEY OF THE LAKES.

Estimate for continuing the survey of the northern and northwestern lakes, for the fiscal year ending June 30, 1858.

For a hydrographical party on steamer:		
1 assistant, at $4 00 per diem, 183 days	$732 00	
1 assistant, at $2 50 per diem, 183 days	457 50	
1 sailing master, at $2 50 per diem, 183 days	457 50	
1 mate, at $1 75 per diem, 183 days	320 25	
1 engineer, at $2 75 per diem, 183 days	411 75	
1 assistant engineer, at $1 50 per diem, 183 days	274 50	
1 carpenter, at $1 50 per diem, 183 days	274 50	
1 steward, at $1 25 per diem, 183 days	228 75	
1 cook, at $1 25 per diem, 183 days	228 75	
1 assistant cook, at 80 cents per diem, 183 days	146 40	
4 firemen, at $1 00 per diem, 183 days	732 00	
14 seamen, at 70 cents per diem, 183 days	1,783 40	
Subsistence 28 men, 50 cents each per diem, 183 days	2,562 00	
Fuel—600 tons of coal, at $6 00 per ton	3,600 00	
Total for one steamer	12,209 30	
For two hydrographical parties, (one on each steamer)		$24,418 60
For a triangulation party:		
1 assistant, at $4 00 per diem, 183 days	$732 00	
1 assistant, at $2 50 per diem, 183 days	457 50	
1 sailing master, at $1 50 per diem, 183 days	274 50	
1 mate, at $1 25 per diem, 183 days	228 75	
1 cook, at $1 00 per diem, 183 days	183 00	
1 steward, at 80 cents per diem, 183 days	146 40	
6 men, at 70 cents each per diem, 183 days	768 60	

Subsistence 12 men, 50 cents each per diem, 183days	$1,098 00	
Hire of a vessel six months, at $200 per month	1,200 00	
Transportation of party and supplies	500 00	
Total for one party	5,588 75	
For two triangulation parties		$11,177 5
For an astronomical and magnetic party:		
1 assistant, at $3 50 per diem, 183 days	$640 50	
1 assistant, at $1 50 per diem, 183 days	274 50	
1 cook, at $1 00 per diem, 183 days	183 00	
7 men, (boat's crew,) at 70 cents each per diem, 183 days	896 00	
Subsistence 10 men, at 50 cents each per diem, 183 days	915 00	
Transportation of party and camp equipage, &c., &c	500 00	
	3,409 00	
For two astronomical and magnetic parties		6,818 0
For a topographical party, six months:		
1 assistant, at $4 00 per diem, 183 days	$732 00	
1 assistant, at $3 00 per diem, 183 days	549 00	
1 assistant, at $2 00 per diem, 183 days	366 00	
1 foreman, at $1 50 per diem, 183 days	274 50	
1 cook, at $1 00 per diem. 183 days	183 00	
1 steward, at $1 00 per diem, 183 days	183 00	
2 leadsmen, at 90 cents each per diem, 183 days	329 40	
2 chainmen, at 80 cents each per diem, 183 days	342 80	
14 boatmen, at 70 cents each per diem, 183 days	1,793 40	
Subsistence 24 men, at 50 cents each per diem, 183 days	2,196 00	
Purchase of camp equipage, tools, &c., &c.	250 00	
Transportation of party and supplies	250 00	
	7,399 10	
For four parties		29,596 4

Miscellaneous:		
Office rent and fuel, per annum	$1,200 00	
Rent of wharf and warehouse per annum	500 00	
Pay of draughtsmen, at $4 00 per diem	1,460 00	
Pay of computer, at $4 per diem	780 00	
Fuel, quarters, transportation four officers	1,500 00	
Four assistants in office, at $4 00 per diem	2,912 00	
Four assistants in office, at $3 00 per diem	2,184 00	
Four assistants in office, at $2 50 per diem	1,820 00	
Steamers in ordinary	4,500 00	
Expenses in office, stationery, drawing-paper, &c., &c	500 00	
Pay of water-level and meteorological observers, 24 stations, at $10 00 per month, for 12 months	2,880 00	
		$19,236 00
Contingencies:		
For current expenses, such as repairs of steamers, vessels, boats; purchase of tents, cordage, blocks, rigging, tools, paints, oils, &c., &c., being 10 per cent. on the whole amount		9,124 65
Total amount of estimate		100,371 15

Respectfully submitted.

APPENDIX K.

OFFICE OF TOPOGRAPHICAL ENGINEERS,
Louisville, October 15, 1858.

SIR: In compliance with the regulations, I have the honor to submit my annual report of my employments during the past year ending June 30, 1858.

Until the 15th of February, 1858, I was attached to the command of the department of Florida, to which State I was ordered in June, 1856.

During the last few months of my being stationed there, the delegation of friendly Creeks and Seminoles arrived from Arkansas; but before seeing the conclusion of this almost interminable war, I was ordered to join the army of Utah. Being attached to headquarters, it was ordered that we should not set out until after the march of the

last column. The party of topographical engineers under Captain James H. Simpson immediately went into camp, and commenced familiarizing themselves with all the various scientific instruments and paraphernalia which the government had provided in order to verify the practical workings of their preparations. While busily engaged in these occupations, I received "Order No. 74" from the War Department, directing me to repair to Louisville, Kentucky, and assume charge of the operations lately under the superintendence of Brevet Lieutenant Colonel S. H. Long.

Captain J. H. Simpson delivered me the above order on the 24th of May, and I had the honor to report my arrival at this post on the 1st of June. By an order of the Topographical Bureau of the 23d of June, Lieutenant Colonel Long was directed to pay over to me the following amounts:

1st.	On account of the improvement of the Missouri river	$1,574 94
2d.	" " " " Arkansas river	1,894 12
3d.	" " " " Mississippi river	1,092 19

As I have been but one month of the year in charge, and have not possession of the official records, my predecessor will give a full history of past events relating to the improvement of the western rivers.

I am, sir, very respectfully, your obedient servant,

JAMES W. ABERT,
Captain United States Army.

Colonel J. J. ABERT,
Chief Corps Topographical Engineers, Washington, D. C.

APPENDIX L.

CAMP ON PARSON'S CREEK OF THE
REPUBLICAN FORK OF KANSAS RIVER,
Kansas, September 26, 1858.

SIR: The report which I had the honor to submit to the bureau on the 1st of October of last year of the operations on the road from a point on the Missouri river, (Omaha,) opposite Council Bluffs City, to New Fort Kearney, Nebraska Territory, informed you that the work, bridges and embankments, contracted for on that road, and then not already completed, viz: the Elkhorn river bridge, one hundred and ninety-four feet in length, and the embankment, three-fourths of a mile long at its west end, were progressing rapidly and satisfactorily, and would probably be finished within the contract time—October 30, 1857—and I have now the honor to report their completion, as

then anticipated. Other small bridges and short side ditches, not included in the contract work on the road, were built by hired labor and purchased timber during last year, and part of the road between Omaha and Elkhorn city changed, shortening the distance between these places about ten per centum. On this part of the road a bridge of thirty feet span, with eight feet abutments, over Cold Stream was erected; and one of fifteen feet span over Butterfly Run; and one of equal length over Barker's Slough, with a side drain of two and a half by four feet width and depth, and one hundred yards in length; and at the Big Papillon bridge two ditches were cut, each three hundred yards long by five feet in width, and varying in depth from two and a half feet to four feet; and I have the gratification to state that all the bridges constructed upon this road have withstood the unprecedented freshets of the present year; whilst most, if not all other bridges in the Territories of Kansas and Nebraska, and many of those in the States of Iowa and Missouri have been carried away.

There remains still unexpended of the appropriation for this road a small balance of between fifteen hundred and two thousand dollars, which should be expended as early as practicable upon small ditches and embankments and the improvement of miry places upon the road.

The additional appropriation recommended in my report of last year, including that of the preceding year recommended by Captain Dickerson, United States army, my predecessor in charge of this road, is again renewed. Its importance need not be more strongly shown than by the simple statement that if this appropriation and the improvements contemplated by it had been made in time for the transportation of army supplies for the present year to Utah alone, more than one-twelfth of the distance by land, and of thirty-three per centum to Fort Kearney, or more than one hundred miles of land transportation would have been saved, and the cost of millions for this transportation correspondingly diminished; and that its importance for the future is equally great. The Mormon emigration and travel after trying all other routes have followed this one almost exclusively for years, even in its unimproved state. Not only is the distance of land travel diminished, but by it the crossing of the South Platte river, with its losses and detentions, and the descent to Ash Hollow, below Fort Laramie, and the crossing of the North Platte above that fort, are avoided—matters of the greatest importance to the traders, transporters, and emigrants to our vast interior country and to the Pacific coast. The fine body of fertile land on the Platte and in the valley of the Loup Fork would, if a bridge were constructed across this stream, be immediately occupied by settlers; and the saving in the supply of Fort Kearney alone for six months at most, and probably in much less time, would exceed the whole appropriation needed for this road.

As stated in substance that it would be in my report of last year, this road is now, with the exception of the crossing of Loup Fork, a good wagon road for all the dry season of the year; but during the spring and June freshets short portions of it will be scarcely, and at times, perhaps, quite impassable, especially in the valley of the Platte,

(in which a great portion of it is necessarily located,) owing to the deep miry sloughs and swampy places, and to the miry character of the soil west of Elkhorn river for several miles, and also west of the Loup Fork, and to the overflow of the Rawhide and other small streams. These overflows and bad states of the road occur unfortunately in April, May, and June during the progress over it of nearly all the emigration going annually by the north side of the Platte to our Pacific coast, and are consequently the cause of much delay and loss to the emigrants and others, and of delay to the mails of the country.

The Loup Fork like all the shallow streams in this part of the country, has a light, shifting, sandy bed, which, during high water especially, is constantly changing, so that where it is fordable one day it is impassable the next, or where it is practicable for a ferry one day the boat grounds the next day in the middle of the stream, compelling the discharge of loads into wagons brought there from the opposite shore across channels as shifting and as difficult as the first; and as it is impracticable for wagons or teams to stand still, even for a short time, anywhere in the river without miring in the quicksands, the difficulties and labors and losses in its passage by thousands of emigrants are very great, and can only be effectually obviated by a permanent bridge. The width of the river averages for twenty miles above its mouth, which embraces the principal crossings, about one thousand feet, with a depth ranging from six inches to six or eight feet. It is filled with innumerable islands and bars which are constantly being formed and washed away; and there is no point known at which a ferry boat can be crossed continuously from shore to shore. The banks are alluvial and of light soil, and wash at many points, but no indications of extensive overflows are anywhere seen in its bottom. There is but a very limited amount of drift wood cast upon its islands, and it is not probable that any heavy drift is brought down by it. Piles would necessarily form the foundations of the piers of any permanent bridge crossing it; and it is believed from the experience gained in driving those for the piers of the Elkhorn river bridge, which is in the Platte bottom, and the Elkhorn river bed, though the stream is much narrower, is very analogous to that of the Platte, that piles driven twenty-five or thirty feet would afford a firm, unyielding support for a bridge over it. Most, if not all, of the timber for the superstructure must necessarily be transported by land from the Missouri river, a distance of eighty miles, and will make it unavoidably a very expensive bridge; but it is believed that its importance will warrant the heavy expenditure in the preservation of the healths and lives alone of the emigrants who annually cross the river and are now exposed for days together in the stream in crossing their teams and property, an exposure which is often followed by dysentery, fevers, and cholera, and has doubtless been one great cause of the multitudes of deaths which have occurred so often among emigrants in the pure air of these elevated plains.

I estimate the cost of material delivered and of the erection of a bridge over Loup Fork on the line of this road at eighty-five dollars

per running foot, or eighty-five thousand dollars for the whole bridge.

The estimate and recommendation for an appropriation of last year to make this an excellent wagon road at all seasons, and which is here renewed, was as follows, to wit:

For bridging small streams, corduroy crossings, culverts, ditches, embankments, improving grades, side cuttings, &c., twenty-five thousand dollars	$25,000
For bridging Loup Fork	85,000
Total	110,000
Deduct amount on hand, say	1,500
Additional appropriation required	108,500

I am, sir, most respectfully, your obedient servant,

E. G. BECKWITH,
Captain 3d Artillery.

Colonel J. J. ABERT,
Chief of the Corps Topographical Engineers.

APPENDIX M.

KEOKUK, *October* 30, 1858.

SIR: I herewith transmit my annual report of the work on the Des Moines Rapids of the Mississippi river.

During the month of October, 1857, the late contractor, J. H. Hager, exhausted the money applicable to his contract, and was paid off. And under orders of the 17th of June, 1857, I being authorized to purchase the necessary machinery for the efficient prosecution of the work, I thought it advisable to purchase the machinery he had on hand, and did so, at a cheap consideration. Further machinery being necessary, I procured such as was deemed best adapted to the work from J. C. Osgood, of Troy, N. Y., well known as a machinist.

It consists of a wrought iron *chisel* or *cutter*, twelve feet long, with a steel point a foot square in the largest part, with proper lifting gearing, and weighing about thirty-six hundred pounds, which is lifted to any desirable height by a pile driving machinery, and dropped upon the stone, thus cutting and breaking it away.

The stone being cut, is lifted out and placed upon a scow, with one of Osgood's underwriter excavators, with great rapidity and success.

These boats and machinery were not quite finished last November, when the winter set in, with unprecedented violence; so sudden was the freezing and ice, that the boats being yet upon the rapids, narrowly escaped destruction, and were damaged. They were, however, got into safe harbor, and made ready for spring operations. At the

opening of the spring of 1858, the river rose and attained the unusual height of 15.24 feet above low water, being only 2.28 feet lower than the great rise of 1851, with this difference; the rise of 1851 was of comparative short duration, and the river subsided to the lowest point. Whereas, the rise of 1858 continued longer than ever known, and is now about four feet above low water and rising, with no prospect of low water this season.

The long continued high water has left a very large deposit of sand upon the chains in the rapids, and also created a bar at the foot of the rapids hitherto unknown. It was deemed advisable by the War Department, as recommended by the bureau, to let the work of improving the rapids again to contract. Accordingly, public notice was given in newspapers for thirty days, soliciting bids. Upon opening the bids, it was found that J. C. Osgood, of Troy, was the lowest bidder, and being in all respects responsible, a contract was entered into with him on the 27th of June, and approved by the department, requiring bonds in the sum of thirty-four thousand dollars, with good and sufficient sureties. And also requiring him to take all the machinéry prepared by the United States for the prosecution of the work at cost price; deducting only what was deemed the amount of damages sustained by the boats, he paying therefor twenty-four thousand dollars, which amount is again applicable to the prosecution of the work.

As soon as it was made known to the contractor that his bid was accepted, he repaired immediately to the work, took possession of the machinery and boats, and commenced active operations the 1st day of September, and has prosecuted the work with great diligence, and to excellent advantage, considering the very high stage of water and untried machinery. I confess that I am not entirely satisfied with the work of the steam chisels; they are effective, but do not cut as rapidly as I had been led to believe. It is, however, proper to say, that *no work whatever* could have been done this season on account of high water, by drilling and blasting.

Expenditures during the year ending June 30, 1858..	$47,370 90
Amount required next year.....	
Amount required to complete the work according to plan.....	700,000 00
Extent of navigation to be benefited from St. Paul to New Orleans.....	2,000 miles.

There being no appropriation applicable to the Rock Island rapids, no work has been done the last year.

Amount necessary to complete the work according to plan	$500,000
Amount which might be judiciously expended next year..	50,000

Should it be found next summer that a greater amount, and different machinery is required for the more rapid and efficient prosecution of the work, the contractor has agreed to furnish it, he promises to use

all his skill, ingenuity and money to prosecute the work to the best advantage.

I am sir, very respectfully your obedient servant,

JOHN G. FLOYD,
United States Agent.

Col. J. J. ABERT,
Topographical Engineers.

APPENDIX N.

HORNTOWN, VA., *November* 13, 1858.

SIR: In accordance with paragraph 1224 of Army Regulations, I have the honor to make the following report of the operations upon which I have been engaged, for the year preceding this date. The orders which assigned me to duty, and thereby relieved me from further connexion with the United States and Mexican Boundary Commission, whose labors were about closing, are successively as follows:

SPECIAL ORDERS, NO. 100.

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, July 9, 1857.

1. * * * First Lieutenant N. Michler, Corps of Topographical Engineers, will hold himself in readiness for duty with "the exploration and verification of surveys already made of a ship canal near the Isthmus of Darien," and will receive special instructions for his government from the War Department.

* * * * * * * *

By order of the Secretary of War.

S. COOPER,
Adjutant General.

ADJUTANT GENERAL'S OFFICE, *Washington, July* 13, 1857.

SIR: The duty to which you were assigned by Special Orders No. 100, of the 9th inst., from this office, having been placed under the general control of the Secretary of the Navy, the Secretary of War directs that you report in person to that officer for instructions, and render such co-operation in carrying into effect the intentions of Congress, respecting the service for which you have been selected, as it may be in your power to afford.

Very respectfully, your obedient servant,

S. COOPER,
Adjutant General.

First Lieut. N. MICHLER,
Corps Top. Engineers, Washington, D. C.

On receipt of this communication I called in person upon the Secretary of the Navy, to inform him that I had been detailed for this interesting duty. Although preparations were immediately commenced in order to be in readiness to sail for the Isthmus as soon as a suitable season arrived for working there; still in consequence of unfinished duties connected with the United States and Mexican Boundary, I was not formally relieved from that Commission by the Secretary of the Interior until the last days of September. I then had the honor to receive the following instructions from the Navy Department, in which Lieutenant Craven and myself are directed to co-operate in executing the duty assigned us :

NAVY DEPARTMENT, *September* 29, 1857.

GENTLEMEN: The 10th section of an act making appropriations for the naval service, approved March 3, 1857, having authorized the Secretaries of War and Navy, under the direction of the President, to employ such officers of the army and navy as may be necessary for the purpose, to make "exploration and verification of the surveys already made of a ship canal near the Isthmus of Darien, to connect the waters of the Pacific and Atlantic by the Atrato and Truando rivers," you have been selected for the execution of this service. The duty assigned you will call into exercise your utmost care and abilities, and it is expected that by a cordial co-operation, the survey in all of its details will be thoroughly and successfully accomplished. It is not deemed necessary to give you any other than such general instructions as may be deemed necessary for your guidance; the plan of operations will necessarily depend on such contingencies as cannot here be anticipated.

On having made a preparatory reconnaissance, you will exercise your judgment in so planning your work as to insure success, always keeping in view the requirements and intention of the act of Congress, and so carefully examining the proposed route that not a doubt may remain as to its character. Let your report be full on the matter, embracing every requisite detail. Should it be deemed advisable to commence the topographical survey on the Pacific side, the presentation of this letter will be sufficient authority to the commanding officer of any naval vessel that may be at Panama, to convey yourselves and party to Humboldt's bay, or such other point as you may desire, provided by so doing other more important duties be not interfered with. Should it be impracticable to afford you a passage, you are authorized to charter or purchase a bungo for the purpose, and any naval officer to whom you may apply for provisions or assistance, is hereby directed to furnish them. Your attention is specially called to the preservation of the health of your party. You will communicate with this department by every opportunity that may offer. Trusting that an undertaking which, if successful, promises

such important results to the world, may be fully developed by your skill and energy,

I am, respectfully, your obedient servant,

ISAAC TOUCEY.

Lieutenant T. A. CRAVEN,
United States Navy, Bound Brook, N. Y., and
Lieutenant N. MICHLER,
U. S. Top. Engineers, Washington, D. C.

On receipt of the communication of July 13, 1857, having conversed with the Secretary of the Navy in reference to the survey, I submitted on the following day for his consideration, a plan of operations for conducting the work, embracing the organization of a party; its personnel and strength; the necessary supplies for its support, and the means for its protection; the requisite transportation to and from the scene of labor, and that best adapted for the navigation of the rivers and streams to be examined ; the necessary instruments for establishing the line, and deciding upon the practicability of the proposed canal; the requisite preparations for preserving and collecting specimens of natural history, botany, minerals, and geology; and also a discussion as to the most favorable season for visiting the Isthmus of Darien; and reasons setting forth the advantage of commencing labor on the Pacific side; in fine, an estimate of the amount of funds necessary to complete both field and office work.

A passport was transmitted to me, issued from the Department of State, and countersigned by his excellency the minister from New Grenada, who commanded, in the name of his government, a safe transit through that Territory. An interesting correspondence also passed between General Cass and General Herran, in reference to the importance of an interoceanic ship canal, and the latter addressed a letter to the Minister of Foreign Affairs of New Grenada, calling on his government to render me all necessary aid and legal protection in prosecuting the explorations for which I was selected.

The detail of officers having been made by the two departments, the natural division of duties assigned the hydrographic examinations of the harbor at the termini of the route, both on the Gulf of Darien and the Pacific ocean, to Lieutenant T. A. Craven, of the navy, and the topographical surveys of the intermediate land and river sections to myself. Each officer accordingly selected his own assistants, organized his own party, and obtained the necessary instruments for the performance of his own specific duties. The limited amount of the appropriation was economized by the greater portion of the instruments having been furnished from the Topographical Bureau and the Interior Department, the Navy Department having supplied the vessel and crew for transporting the party to the Isthmus. On the 15th of October, 1857, the expedition set sail from New York harbor on board the United States schooner Yarina, officered by Lieutenant Craven and Acting Master W. L. Bradford, both of whom had been engaged (previously) for some weeks in getting her in readiness for sea. As she lay upon the water, her yacht-like appearance

presented a pleasant object to the sight, but her sailing qualities proved to be very inferior. Her small measurement of one hundred and forty tons did not offer very commodious accommodations for the number of men stowed away on board. After a successful voyage, we reached Cartagena, New Grenada, on the 4th of November, where we stopped to lay in supplies and obtain a bungo, or river boat, for transporting the parties and their effects up the Atrato and Truando rivers. At last, after many weeks of anxious expectation, the Yarina, on the 3d of December, anchored in the Gulf of Darien, or Uraba, off Furbo, or Pisisi, a small village of the State of Cloco, in the republic of New Grenada; on the opposite side of the Gulf lay the delta, formed by the several mouths of the Atrato. As I am engaged in preparing a detailed report, with the accompanying plans and profiles of the route surveyed for the proposed ship canal, to be presented to the Secretary of the Navy, I will not now enter into any description of the country passed over, but will speak in general terms of the expedition. This will be but a hasty review of the route pursued by the party under my charge, and the manner in which the survey was conducted, compiled principally from reports of my proceedings furnished the heads of departments at different intervals of time.

Leaving Lieutenant Craven to speak of the duty assigned him, I shall but incidentally refer to it, only so far as to show the connexion, if any, between our respective labors. Acting Master W. L. Bradford, with a small party, having been left by Lieutenant Craven in charge of the schooner, with directions to survey the mouths of the Atrato, and the Gulf of Darien in the vicinity, the remaining members of the expedition left the Gulf on the morning of the 9th of December, the barquetona La Concha, a whale-boat, and two life-boats, forming the flotilla for service in the rivers; entering the mouth of the Coquito, one of the arms or Caños of the Atrato, a short distance to the south of the Isla del Muerto, we soon passed through it into that of Barbacoas. Ascending the latter you first meet with Caño Coco Grande, and a few miles further brings you to the Caño Yarena. The last is called by the natives Rio Madré, (Mother river,) and from its appearance well deserves the name, following the general course of the main stream; it is a broad, deep, and magnificent river. We continued up the Atrato to the mouth of the Truando, a distance of one hundred miles, and only two miles above the village of Boca de Lucio, near the junction of the Atrato and Sucio. In this distance several tributaries were passed. No difficulty was experienced in getting the boats along. Leaving the Atrato, our route lay up the Truando for fifty-eight miles to the mouth of the Nercua.

Along this section we met with three interesting features of this stream, first the "lagunas" or lakes, then the "palisados," and in the third place the "saltos" or falls. The intention was to carry the barquetona up to the falls of the Truando, there establish a depot of supplies, and commence the survey. The undertaking proved such a difficult one, owing to the condition of the river, that after ascending a little over twenty-eight miles it was deemed impracticable to proceed any higher. A camp was therefore pitched upon a short

distance above the head of navigation, her freight was discharged, and she was despatched down the river to return to Cartagena for more provisions.

On the 28th of December, 1857, Lieutenant Craven left our first camp with his party in the whale-boat and one of the life-boats, to push forward up the Truando, intending to move on as fast as possible across the mountains to the Pacific ocean, and there make a hydrographic survey of that coast at the western terminus of the proposed route. On the same day my party commenced at that point the survey of the Truando river, with one life-boat and one Indian canoe, which had recently been purchased at Boca de Sucio. It was continued through the palisados under great difficulties and disadvantages, and up to the saltos, which point was reached on the 22d of January. These saltos, or falls, are a succession of rapids and falls nearly four miles in extent, formed by the river breaking its way through one of the spurs of the Cordilleras. The survey of the Truando was discontinued nine miles above the head of the saltos; five miles above them the mouth of the Nercua is reached, and here the route leaves the Truando, and follows it up to its junction with the Hingador, a little more than fourteen miles; the survey was, however, continued up to Tambo, an Indian village further up the stream. Ascending the Hingador, the line continues along it for three miles to a point where the Indian trail from the Nercua to the Pacific first intersects that stream. Two and a half miles above the mouth are the cataracts, over five hundred feet in extent, which offer one of the most picturesque scenes along the route. Nearly sixteen hundred feet above their head are the great falls of the Hingador, surpassing in height and beauty many of those in our own country. The Indian trail referred to, upon leaving the valley of the Nercua, rises at once upon a high ridge of the mountains; the ascent is very steep and difficult. From the Hingador the survey followed this trail across the Cordilleras to the river "Pie de Nercua," a distance of nearly eight miles; down the latter, over a mile, to its junction with the Potumia, and thence, by the bed of the last stream, two miles and a quarter to the first mark of tidal action. A narrow estuary, "Estero de la boca de Potumia," and "Isla de la Playa de Potumia," both together two miles, are then crossed, and you stand upon the shore of the Pacific ocean. Striking the Hingador a short distance above the "great falls," the trail at first continues along its valley, crossing the main stream three different times, and also two small tributaries, in less than a mile. It then leads over a series of parallel ridges to the banks of the Potumia. The Hingador flows towards the southeast, and, after many miles of wandering, its waters find their way through other channels to the Atlantic. A walk of scarcely two miles beyond it, over the summit of the mountains, brings you to the bed of a creek coursing towards the southwest, the Chuperador. This stream, together with a small branch passed previous to reaching it, form the first drains leading towards the Pacific. Beyond the Chuperador, three miles and a half distant, a broad and beautiful stream, the Chupepi, is forded, and a little further on we find two of its branches;

flowing into the Paraenchichi; their united waters are borne by the latter on towards the great outlet, and in a few hours are mingled with and lost among the ocean's waves. On the 10th of February the survey from our first camp on the Truando, up that river, the Nercua, the Hingador, across the Cordilleras, and down the Potumia to the Pacific, including the "Isla de la Playa," was completed. On the same day the party started to return to the Atlantic, following the same route back. Lieutenant Craven had passed, on his way back from the Pacific to the Gulf, the surveying party working up the Nercua. At noon on the 18th of February my party passed our first camp on the Truando, and the survey was resumed of the lower portion of that river, and completed to its junction with the Atrato by the 23d. A line of levels has been run and a complete topographical survey made between the village of Boca de Sucio, near the mouth of the Truando, and the Pacific ocean. The Atrato had, in the meantime, been mapped for a few miles above the Truando, as well as the Sucio and Saluqui rivers for short distances above their junctions with the Atrato. From the commencement of the survey I had placed Mr. John de la Camp in charge of the party running the line of levels; he was assisted by Messrs. J. Schmitt, E. P. Herrick, and W. Hawley, the former making sketches of the route to delineate its topographical features. The results of their arduous labors too faithfully prove the excellency of their work to need further commendation from my hands. On arriving at Boca de Sucio we learned with much regret that the barquetona La Concha had not yet returned from Cartagena. The opportune arrival of a bungo from Quibdo, however, enabled me to despatch two of my assistants and a large part of my men down to the "Yarina" lying in the gulf, retaining Mr. de la Camp's party, with the addition of Mr. W. H. W. Campbell, to assist in the survey of the Atrato. On the morning of the 24th of February this was commenced at the mouth of the Truando, and continued from day to day without interruption, and ended on the 3d of March at the mouth of the Coquito Caño. A few days after it was carried across the Gulf of Darien to the village of Turbo or Pisisi. A few days after leaving Boca de Sucio the "concha" was met. She relieved our life-boat, the Fannie, and our two canoes from their heavy loads, and enabled the party to proceed more expeditiously. In addition to an examination of the geological formation of the country, and the search after mineralogical specimens, one of my assistants, Mr. A. C. W. Schott, made valuable botanical collections, and many hundreds of specimens of natural history, birds, fish, mammals, and reptiles of the country, were procured by him, assisted by William and Charles Wood, two of the party, and are now deposited in the Smithsonian Institute for examination. In addition to the survey of the route, numerous meteorological observations and an interesting set of barometrical measurements were made by Assistant W. H. W. Campbell; also astronomical determinations by myself at the principal points of the route, such as Turbo, junction of the Atrato and Hondo, Boca de Sucio, Camp Toucey, Tocame, falls of the Truando, mouth of the Nercua, Tambo, la Isla de la

Playa, on the Pacific, besides intermediate points; the falls of the Truando were determined in absolute longitude by the meridian transits of the moon and moon-culminating stars for one lunation. Mr. L. Doser accompanied the expedition as computer, and has been diligently engaged since the return of the expedition in attending to the line of duty specially assigned to him.

Mr. William Kennish, who was appointed guide, from his knowledge of this route, the examination of which the act of Congress explicitly directs, had been previously sent under the patronage of an enterprising gentleman of New York, Mr. Frederick M. Kelley, to examine and report upon its practicability for an inter-oceanic ship canal; the duty assigned the officers accompanying this expedition were "to make exploration and verification of the surveys already made," by and under his directions. Mr. Kennish was attached to Lieutenant Craven's party as far as the Nercua, when, that officer having obtained the services of a Choco Indian to guide him across the mountains, detached him and directed him to report to me. Having completed my final work at Turbo or Pisisi, by determining its astronomical position, I awaited the termination of the labors of the party engaged in the hydrographic survey of a portion of the Gulf of Darien, and the examination of several mouths of the Atrato by Lieutenant Craven.

Some delay was experienced in the gulf survey by the necessity which induced Mr. Bradford to sail for Cartagena in search of the long missing barquetona "La Concha", thought to have been lost on her return passage. On the 23d of March the "Yarina" set sail from the Gulf of Darien for the more congenial port of Cartagena. After remaining there for several days, she again weighed anchor homeward bound, and on the 2nd of May entered New York harbor.

Soon after our arrival there I was directed to report in person to the Hon. Secretary of the Navy, at Washington.

But a few days ago I had the honor to receive a communication from the Navy Department, of which the following is a copy:

NAVY DEPARTMENT, *November 6th* 1858.

SIR: The department desires that you will submit to it at the earliest day practicable, the report, plans, and profiles of that portion of the survey of the Isthmus of Darien of which you took notes and observations.

I am, respectfully, your obedient servant,

ISAAC TOUCEY.

1st Lieutenant N. MICHLER,
U. S. Corps Topographical Engineers, Washington, D. C.

While awaiting the above orders, I have been directed by special instructions from the War Department, in addition to my other duties, to assist the commissioners on the part of Maryland and Virginia, Thomas I. Lee, esq., and Angus W. McDonald, esq., in tracing and marking the boundary lines between their respective States. On the 19th of September last I accompanied the commissioners to indentify the position of Fairfax stone at the head waters of the Potomac, the

initial point of the western meridian boundary. Soon after we visited the line on the eastern shore between the Atlantic and Chesapeake bay, and the result of this examination was to request me to "obtain by actual survey as accurately as possible, a plat of the old Scarborough line, traced somewhere about the year 1668 from the mouth of the Pocomoke to the sounds near the sea, and also a continuation of this line westwardly along and near the north shore of Pocomoke bay to Tangier sound." This duty I have been engaged on for the last two weeks, and expect to accomplish it by the end of this month. At that time I will repair to Washington, and take up the report of the inter-oceanic ship canal survey.

I am, sir, very respectfully, your obedient servant,

N. MICHLER,
Lieutenant Topographical Engineers, U. S. Army.

Colonel J. J. ABERT,
Bureau of Topographical Engineers.

APPENDIX O.

CAMP FLOYD, UTAH TERRITORY,
October 14, 1858.

SIR: I have the honor to acknowledge the receipt (yesterday) of circular of August 16, referring officers of the corps to paragraph 1224 of the regulations 1857. It would give me great pleasure, had I the time, to present in detail the duties upon which I have been engaged since I was relieved from the Coast Survey, in February last; but as I am under orders to proceed, as soon as practicable, west about one hundred miles, to make a reconnaissance in that direction preparatory to the discovery, if possible, of a new route to California, I trust the brief report which I shall at present make will suffice; particularly as I expect to make a more complete one during the winter, after active operations in the field shall have closed.

I arrived at Fort Leavenworth on the 23d April, in obedience to orders from headquarters of the army, directing me to report to the officer commanding the reinforcements for Utah. My assistants, Captain Abert, 2d Lieutenant J. L. K. Smith, and Brevet 2d Lieutenant H. S. Putnam, Corps of Topographical Engineers, who had also been directed to report to the same officer, were on the ground at the same date. The officer commanding the reinforcements not arriving at Fort Leavenworth till the evening of the 14th May, I was not enabled to report to him till the 15th of that month. But all this while, and until the 31st of said month, my assistants and party were not idle. The subalterns, not having had any experience in the use of astronomical and magnetic instruments, were set to work with the transit,

sextant, magnetometer, and dipcircle, and practiced in the solution of the necessary problems which came up.

Having received orders from the headquarters of the Utah forces, May 17, to cause maps and itineraries of the route from Fort Leavenworth to the Utah country to be prepared and furnished to the commanders of the several columns and to headquarters, my assistants were also engaged in this work and the necessary maps and itineraries furnished as directed.

My proper position as chief of the department was with Brevet Brigadier General Harney, commanding; but wishing to place my assistants, Lieutenants Smith and Putnam, as well as the topographical party generally, in the routine of field duty, with the consent of the general I took charge of the party as far as Fort Kearney, leaving Fort Leavenworth on the 31st May and arriving at Fort Kearney June 17. Captain Abert (news having been received of the pacification of affairs in Utah) had been relieved from duty with the Utah forces, by virtue of Special Orders No. 74, issued from the War Department, adjutant general's office, May 15 and May 26, he left for Louisville, Kentucky, to take charge of the operations of which Lieutenant Colonel Long had had charge.

Brevet Brigadier General Harney, commanding Utah forces, arrived at Fort Kearney June 25, and I joined him at that post June 29, leaving Lieutenant J. L. K. Smith in charge of topographical party.

I remained with headquarters till July 17, when General Harney having received orders No. 17 from the headquarters of the army, directing a new disposition of the Utah forces, and him to take post at St. Louis in command of the department of the west, I left Cottonwood spring July 17, in obedience to General Order No. 7, Utah forces, July 12, directing me without unnecessary delay to repair to headquarters department of Utah, and report to Brevet Brigadier General Johnston, commanding. I arrived at Camp Floyd, the headquarters department of Utah, August 19, and reported myself to General Johnston the same day. August 23 I reported myself to Major Porter, assistant adjutant general, ready to explore a new route for a wagon road between Camp Floyd and Fort Bridger, which the general had in contemplation. The same day were issued the necessary orders directing the movement, and an escort of one officer and twenty men detailed to report to me. A copy of my instructions is herewith enclosed, marked A.

I left Camp Floyd on the 25th August, in prosecution of the duty, and returned September 12, having been eminently successful. The route reported by me as practicable was from Camp Floyd to the mouth of Timpanogos River cañon, via Lehi, Lake City, and Pleasant Grove; thence up the valley of the Timpanogos to its northeasterly source; thence across the divide to Silver creek; thence down the valley of Silver creek to the old Salt Lake City road, called the "Parley's Park road;" thence by this road over the divide to the Weber river; thence down the valley of the Weber to the mouth of White Clay creek, (Morin's Fork;) thence up the valley of the White Clay creek to one of its eastwardly sources; and thence across the

head waters of Yellow creek, Bear river, Sulphur creek, and Muddy fork in an almost direct course to Fort Bridger, the whole distance being 155 miles, about the same as by the old road through Echo cañon and Salt Lake City. I enclose a map with the route sketched upon it. I also determined the connexions between the new route and the old one, to wit: down the Weber about five miles, down the Sulphur about four, and also down the Muddy about three—three connexions. The route I found far superior to the old one in all the essentials of a good wagon road in this country; the water and grass very abundant, and the wood as much so if not more abundant than on the other road, and the grades of the hills and mountain passes far better. Having reported favorably of the route, the general commanding directed, under date of September 14, a detachment of one officer, five non-commissioned officers, and fifty privates to work the road, under my direction, from Camp Floyd, and a party of one officer and thirty men, also under my direction, to work the road from Fort Bridger. I enclose a copy of the orders, marked B. The road was opened by the 6th of the present month, and already a number of trains have passed over it, and pronounce it a most excellent route. Indeed, the indications are that as soon as it becomes more packed and worn it will take all the travel into the Salt Lake valley towards this quarter; and should a direct route from the head or foot of Utah lake to Carson valley be found, take all the travel from the States to California. Lieutenant Bryan's route to Fort Bridger, in connexion with that I have surveyed and opened from Fort Bridger to Camp Floyd, would then, with that to Carson valley, form a very direct route all the way to California. It is in order to the effectuation of this object that I am now, under the orders of General Johnston, making preparations for an immediate exploration west from this camp for about one hundred miles; the purpose being, if possible, before winter, to find a route heading the great desert (the chief obstacle to the route) to the south, and thus prepare the way for a successful survey all the way through to the Pacific next season.

I would also state that I have taken notes of the travelled route from Fort Leavenworth via Fort Laramie to this camp, and have the means, when leisure will permit, to get up a map and itinerary of distances, wood, water, and grass, which, under the changes that have been made in the route, cannot fail to be of service to the army and to emigrants. I hope, also, to be able to illustrate some of the more notable features of the route by photographic impressions, the negatives of which have been taken.

The topographical party under Lieutenant Smith arrived at headquarters, Camp Floyd, September 15, and on the 18th returned by my direction to Fort Bridger, with the necessary instruments for the survey of the military reserve of that post, agreeably to the orders of the War Department. On the 3d, 4th, and 5th September I was at Fort Bridger, and found Lieutenant Putnam engaged in surveying and establishing the boundaries of the reserve, twenty by twenty-five miles, and Lieutenant Smith about to set out with another party for the survey of the streams and other topographical features of the

interior. The corners I have directed to be designated by heavy blocks of stone, sunk firmly in the earth and marked on each interior face U. S. R., and the sides by wooden posts, placed a mile apart and also marked U. S. R. Lieutenants Smith and Putnam and assistants are to return to headquarters as soon as they finish their present work, or at least before the snows will prevent.

During the winter I hope to prepare a map of this region of country, embracing all the information which has been obtained up to the present moment, and accompany it with a report of all that has been accomplished by the party.

I am, very respectfully, sir, your obedient servant,

J. H. SIMPSON,
Captain of Corps Topographical Engineers.

Colonel J. J. ABERT,
Chief of Corps Topographical Engineers.

XXIV.

ORDNANCE OFFICE,
Washington, November 1, 1858.

SIR: The following report of the principal operations of the ordnance department during the past fiscal year, is respectfully submitted:

The duties of this department are, as frequently stated in annual reports, to provide and furnish ordnance and ordnance stores of every description for the use of the regular troops, and for the permanent fortifications and other military posts of the United States; also the annual supplies for arming and equipping the whole body of the militia. They include the preparation of estimates for those objects, the direction under the sanction of the War Department, and the supervision of all expenditures therefor, and of all operations at the government armories and arsenals, the care and preservation of all military supplies and other public property at those places; the inspection and proof of all cannon, small arms, equipments and ammunition purchased and fabricated for the government, the examination of all requisitions for arms or other ordnance stores for the regular troops and the militia; the ordering of proper quantities of them to the different points where wanted, with the transportation and delivery of those supplied to the States and Territories, and the enforcement of proper and regular accountability for all property of this description belonging to the United States. The annexed statement D. shows that these duties require, for their prompt and efficient discharge, two additional field officers and eighteen lieutenants, and indicate the necessity of an increase of the ordnance corps to that extent.

As the operations of the past year in the discharge of these duties can be more readily referred to by placing them under their appropriate heads, they will be so arranged in this report.

Funds.

Amount, as per last year's report, undrawn from the Treasury July 1st, 1857	$493,868 57
In hands of disbursing officers, same date	62,434 78
Amount of appropriations for the fiscal year 1857–'58 including the appropriation for arming and equipping the militia	1,735,517 10
Received during the year for charges on account of damages to, and lost arms, and from other sources	42,847 75
	2,334,668 20
Expenditures during the year	$1,893,112 11
Remaining in hands of disbursing officers June 30, 1858	56,029 97
Remaining in the treasury undrawn, same date	385,535 12
	2,334,668 20

The separate expenditures from each appropriation will be stated under the respective heads as they occur hereafter in this report.

The accounts of the disbursing officers of this department have all been rendered.

The estimates for the next fiscal year have been carefully prepared and are restricted to the amount that may be judiciously and economically applied to the wants of the service.

Armament of Fortifications.

The expenditures from this appropriation for the fiscal year amount to $184,888 13, and the principal articles procured by purchase and fabrication are as follows:

9 10-inch columbiads.
38 8-inch columbiads.
70 42-pounder guns.
51 24-pounder flank defence howitzers.
1 12-pounder gun.
20 42-pounder casemate carriages.
27 8-inch casemate carriages.
25 8-inch barbette carriages.
3 10-inch barbette carriages.
4 12-pounder carriages.
4 8-inch seige mortar beds.
4 stone mortar beds.
100 10-inch and 877 8-inch shot.
13,219 42-pounder shot.
400 10-inch and 2520 8-inch shells.

Extensive repairs have also been made to the armaments of several of the forts. There has not been sufficient time yet since the authorization of experiments to test gun metals for more than to make the preliminary preparations; the work is in hand and in a good state of progress. In my former reports I have referred to the difficulty of keeping wooden gun-carriages in a serviceable condition at ungarrisoned posts. Most of our permanent fortifications are usually without garrisons, and it is a question whether the maintenance of permanent garrisons at them, independently of other military advantages, may not be a measure of true economy by saving more in the preservation of the armament and other public property than would cover the cost of the maintenance of an adequate artillery force at each. The substitution of wrought iron for wood as a material for gun-carriages has been the subject of experiment. Two carriages of wrought iron for barbette and casemate batteries have been constructed and submitted to severe and extensive trials under the examination of a board of ordnance and artillery officers. The result of the trials enabled the board to report most favorably of the entire suitableness of wrought iron for carriages of position, and of its superiority over wood for such purposes, leaving nothing to be determined but a few details of construction before they are extensively made and introduced into our fortifications. The substitution of this more durable material than

wood for gun-carriages will not, however, obviate the necessity of the presence of a garrison; for it is apparent that no structures, however faithfully made or of whatever material, can be left uncared for without suffering damage.

Every day's experience is more and more convincing of the necessity for a national manufactory of cannon and projectiles. The precautions which we are now compelled to adopt in order to insure as far as possible the use of none but safe and reliable material for the fabrication of iron cannon involve the same cost at each of the private foundries as would be required for a national armory of this kind. When multiplied by the number of private foundries where government cannon are made, and where the materials and manufacture have to be severally tested, the product shows a cost which forms of itself exclusive of other manifest considerations, an ample argument in favor of the erection of a national foundry. This is a matter which has been fully investigated and frequently considered by Congress, and I believe there has been little, if any, diversity of opinion in regard to its expediency.

Ordnance, ordnance stores, and supplies.

There has been expended from this appropriation during the fiscal year the sum of $392,335 35, and the principal articles procured by purchase and fabrication at the arsenals are as follows:

4	12-pounder bronze guns.
1	6-pounder bronze gun.
1	32-pounder bronze howitzer.
69	field carriages, caissons and travelling forges.
8	12-pounder siege carriages.
16	24-pounder siege carriages.
8	18-pounder siege carriages.
12	10-inch siege mortar beds.
9	8-inch siege mortar beds.
1	42-pounder casemate carriage.
1,740	Sharp's carbines.
2	Burnside carbines.
1	double gun, Richards' make.
826	Colt's pistols.
1,000	cavalry sabres.
53	12-pounder cannon balls.
105	8-inch mortar shells.
2,000	spherical case shot, different calibres.
3,721	infantry cartridge boxes.
600	" " box belts.
100	" waist belts.
1,308	" bayonet belts.
3,037	bayonet scabbards, with frogs.
200	cartridge boxes for Burnside carbines.
200	pistol cartridge boxes.
561	waist-belts for sword-bayonets.

1,501 sets of horse equipments.
170 Hope's saddles.
5,033 saddle blankets.
6,629 rounds fixed ammunition for field artillery.
3,016,200 cartridges for small arms.
9,362,634 percussion caps for small arms.
6,166,500 Maynard primers.
139,500 friction primers.
38,251 pounds laboratory paper.

The arms, equipments, ammunition, and other ordnance supplies which have been furnished for the regular service during the year are specified in statement C, hereto annexed. With a view to obtaining the best form of horse equipments for mounted troops four patterns of saddles are now in service, but the reports, as yet received, have not warranted the preference of either to the exclusion of the others.

Arming and equipping the militia.

The expenditures from this appropriation during the fiscal year have been $257,594 44, and the principal articles procured by purchase and fabrication at the arsenals as follows:

10 6-pounder bronze guns.
10 24-pounder bronze howitzers.
19 6-pounder gun-carriages.
500 Sharp's carbines.
7,250 Colt's pistols.
500 non-commissioned officers' swords.
10,000 infantry cartridge boxes.
8,500 cartridge-box belts.
6,300 bayonet scabbards, with frogs.
7,900 waist belts.
5,500 gun slings.
828 rifle cartridge boxes.
500 rifle pouches.
1,750 rifle waist belts.
500 flask and pouch belts.
500 waist belts for rifle sword bayonets.
493 sabre and artillery sword belts.

The apportionment of arms to the several States and Territories according to law, and the supplies which have been furnished to the militia during the year on the requisitions of the governors of each, are set forth in the accompanying statements, marked A and B. By your authority the rifle muskets of the model of 1855 are issued to the States, some of the States having been so furnished. It is believed that this arrangement will have a beneficial effect, as the high finish and attractive appearance of the arm will not only encourage a military spirit in the militia, but will tend to counteract efforts that are being made to induce requisitions from State authorities for arms of

private manufacture, that are more suitable for predatory warfare and personal rencontres than for the use of the militia of the country.

The building for an armory for the volunteers of the District of Columbia has been completed, and is used by them. An enlisted man of the ordnance department has the charge of it until some other arrangement can be made for its custody.

National armories.

The expenditures at these armories during the fiscal year have been as follows:

	Harper's Ferry armory.	Springfield armory.	Total.
Manufacture of arms, appendages, tools, &c., and purchase of materials for the same	$195,277 72	$189,431 50	$384,709 22
For repairs, improvements, and new machinery, including buildings	25,044 68	117,096 41	142,141 09
	220,322 40	306,527 91	526,850 31

The reports of the superintendents, accompanying this, specify in detail the work that has been done at each of the armories during the year.

I stated in my report for the year ending June 30, 1857, that 2,015 of the new rifle muskets had been finished at Springfield. At that time none had yet been finished at Harper's Ferry. Since then, up to June 30, 1858, 19,785 rifle muskets and 1,719 rifles, both of the model of 1855, have been manufactured at these two armories; besides which a considerable number of arms of old patterns have been rifled and rendered suitable for long ranges. At Springfield a new dam, and a forging and machine shop have been nearly completed; operations of the armory being now carried on in the latter. The dam is entirely finished. The whole, in point of excellence and durability will be unsurpassed.

Arsenals.

There are in the United States twenty-three occupied arsenals, including the depots in Texas, New Mexico, and Washington Territory. In my last report I referred to the acquisition of a site for an arsenal in Texas, and of the representations which were afterwards made against the site so acquired. Since then the officer assigned to the construction of that arsenal has made a report in favor of a position in the city of San Antonio, and that report having the approval of this office awaits your sanction. No suitable site has yet been found for the depot in New Mexico; and the site selected for a depot

at Fort Vancouver having been found to be interfered with by the possessory claims of British subjects, the project of building there has been abandoned for the present by your authority.

The erection of a small depot at Fort Leavenworth having been authorized by you, the work will be commenced as soon as an officer can be detailed to superintend it.

The amount expended for arsenals during the year was $100,707 89, and this expenditure has been applied to the objects specially designated in the estimates on which the appropriation was based. They include repairs and preservation of the buildings, fences, wharves, &c.; the erection of new and additions to old buildings, and all improvements of a permanent character. The statements of operations at the principal arsenals hereto annexed are referred to for a more detailed account of the work done under this head. The estimate which I have made under this head is based on special estimates of the commanding officers, carefully examined in this office, and only the most important objects included.

In addition to the foregoing statements of expenditures, under the ordinary heads of appropriation, the following were made out of special appropriations, viz:

For testing gun metal for heavy cannon.

400 barrels of gunpowder	$7,800 00

For purchase of gunpowder for the Pacific coast.

936 barrels of gunpowder	$16,848 00

For purchase of best breech loading rifles.

200 Colt's rifles	$12,841 45
1,400 Sharp's carbines	42,350 00
10 Carbines, Schroeder's patent	300 00
200 Burnside's carbines	6,000 00
	61,491 45

For the purchase of ground for the extension of Washington arsenal.

Payment to owners of the ground	$75,209 77
For surveys, legal investigations of title, and recording of deeds, &c	2,647 82
	77,857 69

In prosecuting experiments on the strength of gun metal, and in proving cannon, evidences of a variation in the force and effect of gunpowder have been detected to an extent not before supposed to exist, attributable to causes not yet clearly ascertained, though no

efforts have been spared to solve the mystery. The great desideratum is a powder that whilst it imparts great ranges to projectiles, shall not by its too instantaneous combustion exert a force capable of destroying the gun before the projectile has acquired sufficient velocity to relieve the gun from the instant pressure of the inflamed powder, acting on the bore like fulminate or gun cotton. Further efforts will be made to arrive at the truth, before purchases of gunpowder are made, beyond our present wants.

Very respectfully,

H. K. CRAIG,
Colonel of Ordnance.

Hon. JOHN B. FLOYD,
Secretary of War.

A.

Apportionment of arms for the year 1858, *under the law of* 1808, *for arming and equipping the whole body of the militia, as amended by the 7th section of the act approved March* 3, 1855, *and the regulations established in conformity therewith.*

States and Territories.	No. of senators and representatives in Congress.	No. of muskets.
Maine	8	365
New Hampshire	5	228
Massachusetts	13	594
Vermont	5	228
Rhode Island	4	183
Connecticut	6	274
New York	35	1,599
New Jersey	7	319
Pennsylvania	27	1,233
Delaware	3	137
Maryland	8	365
Virginia	15	686
North Carolina	10	457
South Carolina	8	365
Georgia	10	457
Florida	3	137
Alabama	9	411
Louisiana	6	274
Mississippi	7	319
Tennessee	12	548
Kentucky	12	548
Ohio	23	1,051
Michigan	6	274
Indiana	13	594
Illinois	11	502
Wisconsin	5	228
Missouri	9	411
Iowa	4	183
Arkansas	4	183
Texas	4	183
California	4	183
*Minnesota Territory	----------	137
*Oregon Territory	----------	137
*Washington Territory	----------	137
*Nebraska Territory	----------	137
*Kansas Territory	----------	137
*Utah Territory	----------	137
*New Mexico Territory	----------	137
*District of Columbia	----------	137
		14,615

* Apportionment according to the first paragraph of the President's regulation of April 30, 1855.

H. K. CRAIG, *Colonel of Ordnance.*

ORDNANCE OFFICE, *Washington*, 1858.

2 mountain howitzer carriages.
4 caissons.
1 travelling forge.
18 sets of artillery harness for two wheel horses.
10 sets of artillery harness for two lead horses.
7,501 muskets and appendages.
490 artillery musketoons and appendages.
40 cavalry musketoons and appendages.
2,998 rifles and appendages.
60 Colt's rifles and appendages.
8 Hall's carbines and appendages.
45 Sharp's carbines and appendages.
250 percussion pistols and appendages.
954 Colt's pistols and appendages.
200 cavalry sabres.
45 horse artillery sabres.
164 non-commissioned officers' swords.
133 musicians' swords.
110 artillery swords.
3,829 sets of infantry accoutrements.
1,627 sets of rifle accoutrements.
40 sets of accoutrements for cavalry musketoons.
200 sets of accoutrements for rifle musketoons.
5 sets of accoutrements for Hall's carbines.
80 sets of cavalry accoutrements.
45 sets of accoutrements for Sharp's carbines.
228 waist belts for sword bayonets.
1,578 infantry cartridge boxes.
1,418 infantry cartridge box belts.
400 bayonet belts.
610 bayonet scabbards.
768 waist belts.
936 rifle cartridge boxes.

20,000 Maynard's primers.
209,000 percussion caps for small arms.
10,000 cannon primers.
10 bullet moulds for Colt's belt pistols.
1 bullet mould for long-range rifles.
4 cannon locks.
6 sponges and rammers.
50 canister shot.
1,000 Colt's belt pistol cartridges.
1,417 spare parts for cadets' muskets.

H. K. CRAIG, *Colonel of Ordnance.*

ORDNANCE OFFICE, *Washington*, 1858.

C.

Statement of ordnance and ordnance stores issued to the army and to the several military posts for the year ending June 30, 1858.

10 12-pounder bronze guns.
6 6-pounder " "
4 32-pounder " howitzers.
4 12-pounder " "
1 16-inch stone mortar.
3 10-inch siege mortars.
1 24-pounder gun.
1 18-pounder gun.
1 10-inch columbiad.
1 8-inch "
1 8-inch seacoast howitzer.
1 8-inch siege howitzer.
6 12-pounder carriages.
14 6-pounder "
4 32-pounder howitzer carriages.
4 mountain howitzer carriages.
18 caissons.
13 travelling forges.
5 battery wagons.
2 24-pounder siege carriages.
1 18-pounder " "
1 12-pounder " "
1 10-inch columbiad barbette carriage.
1 8-inch " " "
43 32-pounder barbette cariages.
3 10-inch siege mortar beds.
50 10-inch shells.

500	6-pounder shot.
580	spherical case shot of different calibres.
1,884	stands of ammunition for field service.
11,486	muskets and appendages.
5,683	rifles " "
1,622	Sharpe's carbines and appendages.
171	pistol carbines " "
170	Burnside's carbines and appendages.
5,535	Colt's pistols " "
99	pistols, North & Savage patent.
617	cavalry and horse artillery sabres.
282	swords for non-commissioned officers and musicians.
11,574	sets of infantry accoutrements.
4,690	sets of rifle accoutrements.
385	sets of cavalry accoutrements.
1,570	sets of horse equipments.
2,262,180	cartridges for small arms.
27,800	pounds of gunpowder.

H. K. CRAIG, *Colonel of Ordnance.*

ORDNANCE OFFICE, *Washinyton*, 1858.

D.

Statement showing the present stations of ordnance officers, and the number and grades of officers required at those stations, in order to discharge the appropriate duties of the department properly and efficiently.

Stations.	Officers at present.				Officers required.			
	Field officers.	Captains.	Lieutenants.	Military storekeepers.	Field officers.	Captains.	Lieutenants.	Military storekeepers.
Ordnance office	1	1	.....	.....	1	1	1	.....
Inspector of armories and arsenals	1	.....	.....	.....	1	.....	.....	.....
Watervliet arsenal	1	.....	4	1	1	1	3	1
Allegheny arsenal	1	1	1	1	1	1	2	1
Washington arsenal	.....	1	2	1	1	.....	2	1
Fort Monroe arsenal	.....	1	.....	.....	1	.....	2	.....
St. Louis arsenal	1	.....	1	.....	1	.....	3	.....
Kennebec arsenal	.....	.....	.....	1		.....	1	.....
Watertown arsenal	.....	1	1	1	.....	1	1	1
New York arsenal	.....	1	1	.....	.....	1	1	.....
Frankford arsenal	.....	1	2	.....	.....	1	1	.....
Pikesville arsenal	.....	.....	.....	.....	.....	.....	1	.....
North Carolina arsenal	.....	1	.....	.....	.....	1	1	.....
Charleston arsenal	.....	1	.....	.....	.....	1	1	.....
Mount Vernon arsenal	.....	1	.....	.....	.....	1	1	.....
Baton Rouge arsenal	.....	.....	1	.....	.....	1	1	.....
Benicia arsenal	.....	1	1	1	.....	1	2	1
Texas arsenal	.....	1	.....	.....	.....	1	1	.....
Arsenal in New Mexico	.....	.....	.....	1	.....	1	.....	1
Arsenal in Washington Territory	.....	.....	1	.....	.....	.....	1	1
Augusta arsenal	.....	.....	.....	1	.....	1	.....	1
National armories	.....	.....	.....	2	.....	.....	.....	2
Apalachicola arsenal	.....	.....	.....	1	.....	.....	.....	1
Detroit arsenal	.....	.....	.....	1	.....	.....	1	1
Little Rock arsenal	.....	.....	.....	1	.....	.....	.....	1
Fort Leavenworth depot	.....	.....	.....	1	.....	.....	.....	1
West Point, N. Y.	.....	1	1	.....	.....	1	2	.....
Foundry service	*1	2	.....	.....	1	1	3	.....
Military departments	.....	.....	.....	.....	.....	.....	.....	.....
Utah expedition	.....	.....	2	.....	.....	.....	2	.....
Special duty and sick leave	.....	1	.....	1	.....	.....	.....	1
Judge advocate of the army	.....	1	.....	.....	.....	1	.....	.....
	6	17	18	15	8	17	34	15

H. K. CRAIG, *Colonel of Ordnance.*

ORDNANCE OFFICE, *November* 1, 1858.

* Stationed at Pikesville arsenal.

Statement of the principal operations at the armories and arsenals during the year ended June 30, 1858.

SPRINGFIELD ARMORY.

JAMES S. WHITNEY, SUPERINTENDENT.

The principal operations at this armory during the year have been as follows:

Arms fabricated.

11,203 rifle-muskets, model of 1855.
4,363 percussion muskets, model 1842, rifled.
7,216 percussion muskets, model 1842, rifled and sighted.
9 percussion cadets' muskets, model 1842, rifled and sighted.
600 cavalry and 60 sappers' musketoons, altered to artillery.
1 sample cadet musket, model 1858.
1 rifle-musket, Belgian barrel.
6 pistols (Brown's patent) in progress.

Appendages, &c., fabricated.

18,943 wipers, model 1855.
11,238 screwdrivers, model 1855.
2,369 ball-screws, model 1855.
10 spring vises, model 1855.
15,238 tompions.
1,552 band-springs and tumbler punches.
81 arm chests and packing boxes.

About 10,000 muskets in the arsenals have been cleaned and oiled during the year.

Machinery.

1 punching-press, completed.
1 swage-drop, completed.
1 grindstone, (run,) completed.
7 tilt-hammers, completed.
1 stamping machine, completed.
2 polishing machines, in progress.
1 machine for finishing breech-screws, in progress.
4 tilt-hammers, in progress.

Fixtures for machines, fabricated to value of $2,166 85; fixtures for shop, fabricated to value of $20,943 54, and tools to value of $3,965 25.

Grounds.

The public grounds on the hill have been kept in good order, with but little labor and expense.

Franklin square has been planted with a large additional number of shade trees, and been made more convenient by walks and avenues.

The continuation of Byers street has been graded, and the embankments sodded, nearly to the northwest angle of the armory grounds.

Improvement at the water shops.

Since the last annual report was made these improvements have been pushed vigorously forward towards completion. During the year a large amount of masonry—about 7,779 perches—has been done in river walls, dam, raceway, and the various shops.

The main front finishing shop has been finished and furnished with shafting and other fixtures, machines, &c.

The forging shop, 332 feet long, has been erected, including a high chimney stack for furnaces and forge fires.

Two turbine and one Munroe's centre-vent water wheels have been placed in the wheel-pits.

Trip-hammers have been erected upon solid foundations. Forges, force-pumps, fan-blowers, and wind-pipes have been put up.

The old grinding and boring shop has been taken down and its machinery and fixtures cleaned and repaired.

Dam, pond, &c.

The old dam has been replaced by a new one ten feet higher. This increase of height has enlarged the capacity of the pond about four-fold. It is computed that the pond will supply a power equal to that of 140 horses twelve hours per day during the driest seasons.

The raceway has been finished to the point formerly occupied by the dam at the middle water shop.

The whole number of bricks laid in buildings, arches, and dam, is 2,484,000.

Excavations of rock amount to 5,500 cubic yards, and of earth to 10,000 cubic yards.

These improvements have, during the year past, been made available for the purposes for which they were intended, being occupied as far as finished, and in full operation.

HARPER'S FERRY ARMORY.

H. W. CLOWE, SUPERINTENDENT.

The principal operations at this armory during the year have been as follows:

Musket factory.—Arms and appendages fabricated.

8,581 rifle-muskets, model 1855.
1,434 percussion muskets, calibre 69, rifled and sighted.
15,826 spare parts of arms for issue to other posts.

23,629 appendages for rifle-muskets.
6,004 tompions for rifle-muskets.
372 ball-screws for percussion-muskets.
130 locks, complete, for percussion-muskets.
1,364 tumbler and band-spring punches for rifle-muskets.
892 screwdrivers forged and tempered.
3,334 long-range sights, and 494 spare parts of same.
293 rifle-musket barrels, polished, unserviceable.
2,484 rifle-musket barrels, in various stages, unserviceable.
6 musket barrels, model 1840, experimental.
2 swages for musket balls, calibre 69.
74 bullet-moulds for expanding balls.
50 arm chests for rifles.

Tools and machinery fabricated and in progress.

1 machine for milling magazine in lock plate, fabricated.
1 machine for cutting cone-seats in barrels, fabricated.
1 machine for cutting edges of lock plates, fabricated.
1 tilt-hammer for forging sword bayonets, fabricated.
1 machine, 6 spindles, for drilling components, fabricated.
2 machines for drilling barrels, fabricated.
1 machine for boring barrels, fabricated.
1 machine for tapping ball-screws and guard-bows, fabricated.
7 extra heads for machines for cutting components, fabricated.
1 cast iron forebay for water-wheel at bell shop, fabricated.
1 set of gearing, shafting, &c., for head of forebay, fabricated.
1 main line of shafting at fan blast wheel, fabricated.
17 feet 7 inches of counter shafting in shops, fabricated.
1 drop-hammer for components, in progress last year, completed.
1 machine for grooving stocks for barrels, in progress.
4 machines for drilling steel barrels, in progress.
1 machine for cutting triggers, in progress.
1 machine for drilling components, improved.
263 tools, various kinds, fabricated.
371 gauges, various kinds, fabricated.

7 milling and cutting, 2 index milling, and 1 gear-cutting engine, and 2-hand power planers were purchased and put in position.

Buildings.

The two buildings on Camp Hill, designed for clerks' quarters, reported last year as in progress of construction, have been completed and ready for occupation. The building on the south end of the Arsenal square, designed as quarters for the master armorer, is advanced, ready for roofing. This building is of the same style of structure as those on the hill, built of brick on stone foundations; the main building being 42 by 38 feet, with wing 25½ by 20 feet, 2 stories high, and roofed with slate.

Dwellings Nos. 9, 25, 27, 30, 31, 44, 126, and 129, have each been slightly repaired.

In the carpenters' department, besides the work for new buildings, 400 arm chests have been altered to suit the new gun, and 69 packing boxes for swords and other parts of arms, have been made; 5 swords racks and 3 new workbenches have also been constructed.

All the workshops have been slightly repaired, and the exterior walls painted.

The enclosing wall and iron picket fence, on the south side of the armory canal, has been painted its entire length.

The old "paymaster's office" has been taken down, to make room for the master armorer's quarters.

Grounds.

A new and improved wagon road has been constructed from the east end of the Shenandoah bridge, through and up to the wood land on the top of the mountain, belonging to the United States, from which the supply of coal and wood for the armory is obtained.

121 perches of dry wall and 132 yards of earth excavation, for a drain, built on the dividing line, or ravine, separating the clerks' quarters, on Camp Hill.

64 perches of dry wall and 84 yards excavation for a cesspool, at the rolling mill.

The stable yard has been improved, and 125½ square yards of paving, with large flagstones, have been laid in front of the carpenters' shop and stock house.

1,179 yards of the inner face of the canal wall has been pointed with mortar.

35 cut stone bases, for fence in front of armory offices, have been purchased ready for doing the work.

2,193 yards of excavation and filling has been done to improve the grounds about the clerks' quarters, on Camp Hill.

1,456 perches of heavy stone masonry have been constructed as a breastwork for the repair of the dam over the Potomac.

The west face of the Winchester and Potomac railroad wall, on the east line of the Arsenal square, has been faced, the materials of the wall having considerable projections, which rendered it unsightly and easy of descent into the yard by boys or others; the wall itself having been raised several feet, in pursuance of the plan extending the Arsenal square.

All the reserved grounds, including the area within the armory enclosure, the terraces below the new magazine, and in rear of the new stock house, have been carefully improved, at considerable cost, and many of the streets graded and rendered easy of access and ordinary travel.

A new set of beams for the lock gate, at the head of the armory canal, were put in position, and a platform across the locks constructed, for the convenience of opening and closing the same.

3,852 screwdrivers and extra cones, for rifles.
2,251 sword bayonets, for rifles.
1,719 movable sights for rifles, model 1855.
85 swages for balls.
1 drift for swage, .54 calibre.
2 locks, model 1855.
1,416 spring vises.
2,491 wipers and spring vises.
2,582 rifle stocks finished for percussion rifles.
8 core pins for bullet-moulds.
20 rear sights for altered muskets.
5,867 parts for repair of arms, supplied to other posts.

Tools and machinery fabricated and in progress.

1 machine for banding stocks, fabricated.
1 machine for tapping breech screws, fabricated.
1 machine for boring barrels, fabricated.
1 machine for tapping barrels, fabricated.
1 machine for facing rifle stocks, fabricated.
12 machines for stocking, altered from old to new model.

Counter line of shafting in finishing shop improved.

1 set of forging tools for breech screws, fabricated.
2 sets of tools for sword bayonets, fabricated.
1 set of tools for tompions, fabricated.
5 sets of tools for making components, fabricated.
169 gauges, assorted, fabricated.

Buildings.

factory has been completed, and the piers and gateway constructed, and a part of the wall on the canal erected.

The gravel bar, arising from the wash of the ravine in the vicinity into the canal, has been removed, and the obstruction to the flow of the water temporarily obviated.

The enclosing wall around the factory, with the iron pickets, gateway, and piers, has been thoroughly painted.

Special work.

A considerable amount of experimental work on rear sights, for trial, has been carried on; experimental firing and trials for the proper graduation of the same, and some rifle barrels rifled and bored for experiments at the navy yard, Washington.

Sixty issues of ordnance stores and supplies for the army, and for arming and equipping the militia of the States, have been made, consisting of a great variety of arms, appendages, and the component parts of arms, of the new model.

WATERVLIET ARSENAL.

COMMANDED BY MAJOR A. MORDECAI.

The following is a list of the principal ordnance stores prepared and articles manufactured during the year :

20 field gun-carriages and implements.
25 field travelling forges, with tools and spare parts.
14 mountain howitzer carriages and equipments.
6 prairie howitzer carriages.
6 prairie ammunition carts.
32 siege gun-carriages and implements.
3 mortar wagons.
29 siege mortar beds and implements.
6 siege mortar platforms.
25 sling carts.
21 casemate and garrison gins, with blocks, &c.
18 columbiad barbette carriages and chassis, with implements.
15 gun and S. C. howitzer carriages and chassis, with implements.
1 42-pounder casemate carriage, with implements.
116 barbette pintles and plates.
50 sets of traverse circles.
4 casemate trucks.
7 lever-jacks.
44 screw-jacks.
14 pent houses.

44 tarpaulins
1 two-horse wagon.
1 hand cart.
70 sets artillery harness for two horses.
30 pack-saddles and harness.
11,312 cap-pouches and picks.
600 budge-barrels.
33 pendulum harness, for field guns.
33 breech-sights for garrison guns.
21 gunners' calipers.
412 rounds of shells.
848 rounds of spherical case shot, fitted with Boorman fuses for field service.
104 12-pounder shells, charged and fitted with fuses.
497 12-pounder spherical case, charged and fitted with fused.
32 12-pounder canisters, fixed.
2,300 cartridge bags for field ammunition.
627,220 expanding ball cartridges, for rifled arms.
616,000 blank cartridges, for rifled arms.
2,295,000 expanding balls, for rifled arms.
1,020 10-inch columbiad sabots.
1,993 packing boxes.
397,510 feet of carriage timber and lumber received.

WASHINGTON ARSENAL.

COMMANDED BY BREVET MAJOR G. D. RAMSAY.

The principal operations at this arsenal have been the following :

Principal articles fabricated.

100 sets of irons for 24-pounder howitzer carriages and chassis.
10 portable forges, with smith's tools.
20 chests, with carriage-maker's tools.
23 caissons.
23 spare wheels.
1 8-inch wrought iron carriage and chassés, (experimental.)
518,850 ball cartridges for small arms.
33,000 blank cartridges for small arms.
750 musket buckshot cartridges.
1,172 six-pounder cartridges.
4,800 bullets, calibre .58.
116 signal rockets.
969 metal fuses.

25 Hubbell's fuses and sabots.
87 rounds of fixed ammunition for field artillery.
300 cap pouches.
120 gunners' pouches.
35 vent covers.
20 leather watering buckets.
84 drivers' and valise saddles, with stirrup leathers, &c., valise straps for artillery harness.
106 bits.
140 pounds black and olive paint.
68 bricoles.
2,130 cartridge bags for cannon, different calibres.
42 roller and trail handspikes.
5 rammers and sponges—six-pounder.
2 sets of moulds for making metal fuses.
28 fuse and fuse-plug wrenches.
26 fuse cutters.
1 gun-rack for Columbian armory.
1 accoutrement press for Columbian armory.
1 desk, one table, } for Columbian armory.
1 coal box, 2 desk stools, }
1 set caryall harness.
8 oil cans, 40 packing boxes, and a variety of fire-works.

Articles unfinished.

29 32-pounder barbette carriages and chassis.
20 sets of irons for carriages and chassis.
50 pole pads and straps.

Other work done.

1 cistern built, capacity of 29,661 gallons.
1,320 feet wooden fence on boundary of arsenal grounds.
59 32-pounder carriages and chassis repaired and painted.
147 rifles repaired.
510 packing boxes for cartridges altered.
44 iron blocks for gins repaired.
1 field battery fitted up for artillery school of practice.

Several of the storehouses have been painted on the outside, and various repairs made. The shops are in an unsafe condition, and have required much repair.

In addition to the foregoing, extensive trials have been made with various fire-arms presented by inventors, and reports made of the results. The ballistic pendulum has also been frequently used in proving samples of powder sent here for that purpose.

This arsenal was in charge of Major W. H. Bell up to the 3d of June, when he was relieved by the present commanding officer.

Field artillery, carriages, equipments, &c.

1 Guthrie & Lee's experimental gun and carriage.
32 field carriages, complete.
5 field carriages, without limbers.
553 implements and equipments, for artillery, different pieces.
112 large tarpaulins.
10 small tarpaulins.
21 spare poles.
9 spare wheels.
Tools, &c., for travelling forges,
Infantry, cavalry, and rifle accoutrements.
11,032 cartridge boxes.
12,412 cartridge box plates.
9,664 cartridge box belts.
12,290 cartridge box belt plates.
11,081 bayonet scabbards, with frogs.
8,738 waist belts.
13,583 waist belt plates.
6,150 gun slings.
6,872 cap pouches and cone picks.
1,412 rifle cartridge boxes.
1,090 rifle cartridge box plates.
1,520 cavalry sabre belts, upper leather.
500 carbine slings, upper leather.
509 pair holsters.
501 soft leather caps for holsters.
821 non-commissioned officers' waist belts.
5,010 belt pistol holsters.
2,448 non-commissioned officers' belt plates.
8,000 buttons and 2,500 studs for accoutrements.

5,000 pounds of elongated bullets, .58 calibre.
A quantity of fire-works.
2,443 packing boxes.

Machines, &c.

1 press for making elongated bullets.
1 machine for rolling bars of lead.
3 moulds for casting lead.
188 feet of main-line, and 113 feet of counter shafting, with pulleys, bands, &c., complete, made and put up in the new shops.

The following machines have been put in operation in the new shops:

2 double, 1 single, and 1 hand engine lathes.
1 patent paper-cutter.
2 large grindstones.
1 dialling engine.
1 iron and 1 wood planer.
1 circular saw.
1 patent circular shears.
1 elongated bullet press.
1 dovetailing machine.
2 drilling and 2 milling machines.
2 punching and 2 rolling machines.
2 rifling machines.
1 spoke-turning machine.

Other work done.

7,460 cubic yards of earth, &c., dug and removed.
3,965 lineal feet of iron water, sewer, and steam pipes laid.
1 frame building, 50 by 37 feet, 1½ story, erected.
289 lineal feet of tunnel, 5 by 4¼ feet, excavated, walled, and arched; and a force-pump well dug and walled.
7,090 muskets cleaned, oiled, and replaced in arsenal.

The new machine shop and armory fitted up with hoisting apparatus, tool closets, water and steam pipes, wash troughs, racks, &c.

The quarters, barracks, shops, stables, water reservoirs, water works, gas works, roads, gutters, sewers, fences, machines, tools, &c., kept in good condition.

FORT MONROE ARSENAL.

COMMANDED BY CAPTAIN A. B. DYER.

The principal operations at this arsenal during the year were as follows:

Buildings and improvements.

New workshops commenced; concrete foundation partly built.

Addition to subalterns' quarters of two rooms.

Kitchens and servants' rooms of quarters pulled down and new ones of brick, two stories, erected.

Wharf extended 30 by 47 feet.

Stores fabricated.

7 8-inch columbiad casemate carriages, complete.
1 gunner's level.
58 manœuvring handspikes.
3 lanyards for friction primers.
3 32-pounder ladles and staves.
53 rammers and staves for different calibres.
56 sponges and staves for different calibres.
10 breech-sights for cannon.
1 pair gunner's sleeves.
350 cartridge bags for cannon, different calibres.
70,500 rifle-musket ball cartridges.
2,998 rifle-musket balls cast.
2 pounds quick match.
219 signal rockets.
1 set of fire-works
2 slings for cannon.
247 rollers, blocks, and chocks for mechanical manœuvres of heavy artillery.
42 sabots, for different calibres.
250 pounds olive and black paint.
2 drifts; 1 copper hammer; 1 copper scoop.
2 paper presses for making cartridges.
32 packing boxes.

Other work done.

1 8-inch columbiad wrought iron barbette carriage and chassis altered to 10-inch.
56 iron guns, columbiads, and howitzers moved from wharf to gun yard, cleaned, lacquered, and skidded.
11,397 shot and shells hauled from wharf to gun yard.
170 iron guns and mortars moved and skidded.
65,974 shot and shells cleaned, lacquered, and piled.
2,904 cubic yards sand, filled in marsh.
8,830 square feet of beds for shot piles, of brick and cement, built.
95,850 bricks, brought from Hampton for new workshops.

Experiments to test 8-inch columbiad wrought iron barbette carriage and ranges, of different kinds of powder, made by a board of

officers, and reports transmitted to Ordnance Office, November 30 and December 31, 1857.

10-inch columbiad mounted on experimental wrought iron carriage, and fired 156 rounds to test carriage and determine ranges; trials not finished.

12 rounds fired from 12-pounder field gun for ranges, and to test metallic fuses.

Experiments with Sawyer's rifle-cannon; fired 60 times. Report made May 18, 1858.

Experiments with Hubbell's fuse. Report made June 2, 1858.

Armament of Fort Monroe repaired and painted, as follows:

6 32-pounder casemate carriages repaired.
7 pass boxes repaired.
7 6-pounder sponges and rammers repaired.
2 siege platforms for guns and 1 for mortar, fabricated for the post.
15 42-pounder carriages complete.
51 iron guns cleaned and lacquered.
4 24-pounder howitzers cleaned and lacquered.
5,300 cannon balls cleaned and lacquered.

Post laboratory fitted up for artillery school of practice, &c., &c.

ST. LOUIS ARSENAL.

COMMANDED BY MAJOR W. H. BELL.

The principal operations at this arsenal during the year have been as follows:

Fabricated.

16 handspikes for field carriages.
1 lantern.
52 sponge and rammer staves.
18 tangent scales for 6-pounder guns.
380 12-pounder shot, fixed.
1,812 rounds of spherical case shot and shells, for field service, fixed.
380 12-pounder spot, strapped.
345 6-pounder canisters, fixed.
1,860 rounds of spherical shot and shells for field service, strapped, with metal fuses.
278 32-pounder howitzer shells, strapped.
222 32-pounder howitzer spherical case shot, strapped.
648 howitzer and 6-pounder canisters.
3,173 canisters for cannon, different calibres.

[illegible] pole chains, 12 pole yokes.
12 pole props, ironed.
15 pole prop-sockets and ferrules.
1 pound iron rivets.
16 splinter bars.
100 spokes for field carriages.
55 rammer sponge-heads for guns and howitzers.
5 caisson stocks.
215 linch, shoulder, and assorted washers for axletrees.
216 double eyes for pole and breast straps.
425 chains and 500 toggles for leather traces.
3,978 picket pins.
52 light leaf-springs and screws for rifle-musket.
4,210 sabots for field ammunition.
853 cartridge blocks.
900 fuse plugs.
4,015 cylinders and 4,965 caps for field ammunition.
6 balls, assorted; 22 hooks; 10 pounds of solder.
103 lights of window sash.
7 sky-light frames.
57 rails, sleepers, and stakes for mortar platform.
582 pounds paint; 20 pounds putty.
2 benches; 4 ladders; 1 box for parts of arms.
9 cherris for balls.
1 lathe-chuck; 3 copper funnels.
746 rifling, and 24 fuse cutters.
4 fullers, assorted.
12 knives for trimming, and 11 iron ladles for casting bullets.
1 mandril; 9 punches, assorted; 9 rifling rods.
1 saw machine; 2 stands for small arms.
12 shoeing boxes.
32 taps, vises, and wrenches.

Other work done.

4,250 percussion muskets rifled, and ramrods drilled.
45 sets artillery harness altered to Grimsley's pattern.
184 sets artillery harness overhauled, cleaned, and greased.
2,869 shot and shells gauged, cleaned, and lacquered.
1,809 rounds field ammunition overhauled and repaired.
179 muskets, rifles, and pistols repaired.
100 dragoon saddles repaired.
2,000 muskets examined as to their fitness for being rifled.
143 pairs spurs repaired.
310 leather traces ironed.
600 ammunition boxes painted.
2.850 square feet of flooring laid.
450 square feet of ceiling put up.
400 lineal feet of casing put up.
100 feet of lattice-work put up.
150 square feet of sheathing laid on roof of machine shop.
7 skylight frames set in roofs of shops.
96 feet of gutter and down pipe put up on shops.
150 lineal feet of fence put up.
500 lineal feet of curb-stone set.
1,201 sets horse equipments received, inspected, and repacked.
588 chests of small arms received and inspected.
4,049 boxes of ordnance stores received and inspected.
14 travelling forges equipped and issued.
4 battery wagons equipped and issued.
15 gun carriages equipped and issued.
14 caissons equipped and issued.
608 arm-chests with small arms examined and issued.
7,135 boxes of ordnance stores examined, packed, and issued.

A minute annual inventory made of all the ordnance and ordnance stores at the arsenal; public buildings repaired, whitewashed, and painted; roads extensively repaired; and general improvement of arsenal grounds.

This arsenal was commanded by Brevet Major G. D. Ramsey until the 28th of May, when he was relieved by Major Bell.

NEW YORK ARSENAL.

COMMANDED BY BREVET MAJOR W. A. THORNTON.

The principal operations at this arsenal during the year have been as follows:

Fabricated

82 pounds of bullets, Schroeder's patent.
2,200 ball cartridges, Schroeder's patent,
333 cartridge bags; 12 and 6-pounder.
50 trails for signal rockets.
338 feet of copper gutter.
262 feet of copper pipe.
120 gutter supporters, or hooks, (iron.)
338½ feet of lightning rod.
33 supporters for lightning rod.
60 bolts, nuts, and washers.
5 pairs of strap hinges, large.
2 window bars, hooks and rivets.
10 ventilators for magazine.
55 bolts for barbette carriages.
160 rivets for barbette carriages.
50 casemate carriage chocks.
27 pounds spikes and nails, iron and copper.
24 sliding bolts and sockets for storehouse doors.
5 granite posts for gate.
310 feet, lineal, of iron fence.
3 gates for fence.
1 ladder, 30 feet long.
1 drawing table and desk of oak.
1 stonemason's hammer.
889 pounds of paint.
200 pounds putty.
29 cribs for packing field carriages.
44 tin boxes for packing small arms.
605 packing boxes.

Stores repaired.

97 barbette carriages, by adopting 250 new pieces.
97 barbette top carriages. by adopting 371 new pieces
730 carriage bolts, by cutting new threads.
56 rail plates dressed over.
88 sword belts, blacked.
1,603 bayonet scabbords, blacked.
506 rifle pouch belts, blacked.
100 rifle muskets fitted with "Ward's hammer.
2,873 bayonet scabbards.

Other work done.

97 barbette casemate carriages, painted.
11 caissons, 2 mortar carriages and 1 boat, painted.
539 implements, and 1,032 lineal feet iron fence, painted.

4,677 square yards walls of buildings, painted.
2,212 square yards walls of buildings, whitewashed.
50 cubic yards of excavation for fence.
47 posts for iron fence and gate, set up.
50 cubic yards of foundation for fence, put down.
1,000 bricks laid in cement, coping to fence foundation.
310 lineal feet of iron fence, set up.
3 iron gates hung.
4,444½ square yards of flagging laid around buildings.
511 cubic yards of stone broken to McAdamize roads.
1,743 square yards of grading around buildings.
1,509 square yards of sodding, cut and laid.
97 guns dismounted and remounted in repairing carriages.
107 guns hauled to and from ordnance yard.
808 guns cleaned, oiled, and lacquered.
18,803 shot and shells cleanedand lacquered.
34 casemate top carriages lacquered.
72 shot beds and 1 crane lacquered.
27,994 pounds of hay hauled from wharf to barn.
17,950 pounds of powder hauled to and from magazine.
5,386 shot and shells hauled to and from yard.
124 chassis and carriages hauled to and from yard for repairs.
40,594 feet of lumber hauled to yard.
723 loads of stone, sand, sods, &c., hauled to yard.
4,236 boxes of arms, &c., hauled to and from stores.
76,696 pounds laboratory paper, weighed and piled.
600 feet of hose oiled.
769 chisels sharpened.
400 square yards of flooring laid in buildings.
134 square yards of furring put up, lathed and plastered.
450 square feet of partitions put up in buildings.
8,047 small arms cleaned, oiled and repacked.
16,831 belt plates cleaned and rebundled.
14,770 pieces of accoutrements cleaned and repacked.

Inspected at contract establishments

68,268 cartridge boxes, belts, bayonet scabbards, &c., &c.
300 rifles, Colt's patent.
200 carbines, Burnside's patent.
2,240 carbines, Sharp's patent.
10 carbines, Schroeder's patent.
500 non-commissioned officer's swords.
1,000 light cavalry sabres.
1,000 powder flasks.
8,076 Colt's pistols, belt size.

In addition to the foregoing enumeration, much work has been done at the arsenal, that cannot be specified in this report.

FRANKFORD ARSENAL.

COMMANDED BY BREVET MAJOR P. V. HAGNER.

The principal operations at this arsenal during the year have been as follows:

The alteration of muskets, model of 1822, to use the tape primer, and the rifling of these and the repaired percussion muskets; the fabrication of primers, caps, and friction tubes; and the manufacture of several inspecting instruments, accurately measuring minute divisions of weight, space, and time, have been the principal shop-work. The Messrs. Remington have completed the delivery of the 20,000 sets of parts for altering muskets, agreeably to contract; nearly the whole of these have been applied to arms without the loss of a single breech-piece or lock-plate. By your permission 2,000 muskets belonging to the State of New Jersey are to be fitted with these parts at the expense of the militia fund due that State. The remainder will be applied to arms in store here. Frequent experiments during this year, as well as heretofore, have shown that the musket thus altered, becomes a very serviceable and accurate arm, at distances of 500 yards, and, as has been heretofore proven, has still a respectable degree of accuracy much beyond this distance. As it is of but little value as an arm of accuracy at present even at distances of 200 yards, the improvement should be regarded as well worth the expense of alteration, as these arms cannot yet be replaced by new ones. It is believed that a lighter ball and charge than that now prescribed would remove the chief present objection (the force of recoil) and make this arm much more acceptable to the troops.

Extensive trials have been made during this year, resulting in removing causes of failure in the use of the Maynard primer with the new model musket, and also in improving in quality the primer and the friction tube for cannon.

As directed by your orders, experiments are in progress at this arsenal, upon the recommendation of the Ordnance Board, "with a view to improve our present regulations for the proof and inspection of gunpowder for the military service." A great variety of samples furnished by the chief manufacturers, who have shown great anxiety to assist in every way possible the efforts of the department, have been tested *as now prescribed*, with instruments of improved accuracy and also with *new* instruments, developing peculiarities not heretofore observed; sufficient progress has not yet been made to enable me to give definite instructions to the manufacturers which can safely guide them in making army powder. But the experiments have, it is believed, established conclusively that important differences, greatly affecting the degree of strain exerted upon the gun at the moment of discharge, do exist in powders heretofore received, and that no sufficient means of detecting this quality has heretofore been used or known. In order to demonstrate the above mentioned difference of pressure and to obtain a comparative measure of its force, I have

attached a dynamometer to the ordinary eprouvette. A hole is drilled through the metal of the eprouvette, at right angles with the axis of the chamber, entering it at about half its length, and a plug fitted to this neatly, the lower end of which coincides with the interior surface of the chamber; the plug is held in place by a spiral spring, bearing between a shoulder on the plug and a strong strap of iron attached to the gun. Upon discharging the eprouvette, loaded as heretofore, a portion of the pressure exerted by the gas comes directly upon the end of the plug, moving it outwards and compressing the spring holding the plug in place. The amount of compression, varying with different powders, is measured with great accuracy by calipers, and these measures of length, reduced to pounds by practical trial with weights, testing the springs. The trials have shown that powders found in practice to have a violent effect upon shells, breaking them in the gun, develope here a degree of pressure above that due to the cotemporaneous range, while the powders give equal or greater ranges with less measured pressure. An accurate chronometer has also been made and used in testing the time of burning in open train, and in closed bags. This is started and stopped by the burning train, and the interval, the time of burning any desired length, is recorded in seconds and hundredths of seconds. This instrument also shows a very marked difference between the different powders in service. Other tests and instruments have also been tried, and it is hoped that some valuable advance has been made in this important matter, but it is impossible yet to detect all the relations between the above described differences and the mode of manufacture at each mills so as to control the results as desired.

Fabricated.

139,500 friction tubes for cannon.
6,166,500 percussion primers for Maynard locks.
7,972,134 percussion caps for small arms.
514 pounds fulminate of mercury.
661 pounds percussion powder.
110 pounds friction powder.
2,096 portfires.
6,830 flint muskets, model 1822, fitted with self-priming locks and chambered breechpieces, and rifled. Front and rear sights have been attached to 4,852 of these.
1,300 flint muskets, model 1822, belonging to State of New Jersey, fitted with self-priming locks and chambered breechpieces and rifled. Front and rear sights attached to 200 of them.
979 percussion muskets rifled, and 299 fitted with sights.
762 scarlet and blue surcingles, five inches wide.
1 star gauge and 1 set ring gauges for same.
36 ring gauges, different calibres.
2 calipers.

2 standard scales.
1 set standard weights from 5,000 to $\frac{1}{10}$ of a grain.
2 mico-chronometers.

Other work done.

3 mortar eprouvettes and balls, inspected and received.
8,450 Maynard locks and breech pieces, inspected and received.
564 sets dragoon equipments, inspected and received.
5,023 saddle blankets, inspected and received.
335 horse brushes, inspected and received.

Six hundred sets of new pattern horse equipments have been inspected and put in service during the year. New pattern of blankets and surcingles have also been adopted and a number distributed to the army.

BENICIA ARSENAL.

COMMANDED BY CAPTAIN F. D. CALLENDER.

The operations at this arsenal have been, during the year, principally the following:

Buildings and improvements.

One stone fire-proof magazine No. 2, 105 $\frac{7}{12}$ feet by 36½ feet, erected, covered by stone groined arches and slate roof, and capable of containing 3,000 barrels of powder.

One stone reservoir, 5,000 gallons capacity, built to furnish water to the steam engine.

One wood building 18 by 28 feet, added to barracks for housing fire engine, hose carts, &c.

One furnace for casting bullets, built and put in operation.

One steam engine introduced in armorer's shop and put in operation.

Two rifling machines to be propelled by steam, set up.

One stone culvert, 581 by 2½ feet, built.

Fabricated.

113 holsters for Colt's pistols.
100 surcingles.
708 6 and 12-pounder blank cartridges.
38 rounds of case shot and shells, 6 and 12-pounder fixed.
1,001 6 and 12-pounder cartridge bags.
14 12-pounder sph'l case shot bursters.
270,675 cartridges for small arms.
351 ammunition and packing boxes.

64 arm chests.
333 pounds of paint.
15 gallons of gun lacker.
Tools for shops, toools, stone trucks, &c., for quarry.
490 percussion muskets rifled.
304 muskets and other small arms, repaired.
70 swords and sabres "
57 dragoon saddles and accoutrement repaired.
Public buildings, fences &c., kept in repair
Wagons, stone trucks, derricks &c., repaired.

Other work done.

11,723 small arms, cleaned oiled and repaired.
358 cavalry sabres " " "
16 sets of artillery harness cleaned, oiled and repaired.
250 pieces of accoutrements " " "
4,595 " " blacked.
28 iron cannon and 4,400 shot and shells, cleaned, scraped and lacquered.
422 ammunition boxes painted,
2 gun carriages and limbers } scraped, cleaned and painted.
2 caissons and limbers }
2,000 packages of ammunition moved and stored in new magazine.
718 boxes and packages of ordnance stores received and stored.

Tools sharpened and repaired for the various shops; wagons, harness, &c., &c., repaired.

Grading, filling and excavating done on arsenal grounds; and arsenal fences extended.

At Forts in the Harbor.

70 8 and 10-inch guns, and 24-pounder howitzers, cleaned and lacquered.
49 8 and 10-inch carriages and chassis, cleaned and oiled.
15 24-pounder howitzer carriages " "
46 tarpaulins for columbiads " "
Traverse circles and elevating screws of same, cleaned and oiled.

The ordnance and ordnance stores required for the Troops in the department of the Pacific, and for the militia of Washington Territory, have been prepared and forwarded from this arsenal; also, large supplies of ammunition and other ordnance stores forwarded to the Vancouver depot.

Articles fabricated.

30	8-inch columbiad barbette and casemate carriages.
20	42-pounder gun " " "
160	iron handspikes.
51	ladles, rammers, worms and sponge heads, with staves.
10	elevating bars.
57	cannon wads.
994	cartridge bags, various calibres.
653	cartriges, " "
100	fuzes.
1,132	sabots " "
590	shell straps.
525	cartridge blocks.
1	garrison gin, with ratchet windlass.
1	sling cart, large.
1	hand lathe.
3,709	pounds of paint.

Other work done.

683,000	musket cartridges, for flint arms, broken up.
1,000	rifle ramrods altered.
298	rifles fitted with sword bayonets.
1,820	feet of iron fence, lacquered.
1,245	shot and shells lacquered and piled.
17	casemate iron carriages, lacquered
50	barbette and casemate carriages painted three coats.
6,972	yards of painting on public buildings.

NORTH CAROLINA ARSENAL.

COMMANDED BY CAPTAIN J. A. J. BRADFORD.

The principal operations at this arsenal during the year have been as follows:

1. *Work done on the enclosing wall of large magazine.*—Mortar made therefor and 51,200 bricks laid therein, and the brick masonry of the wall completed. 1,410 superficial feet of stone have been cut for its gateway and coping, and about half of all its coping set in place. 1,725 stone-cutters' tools have been sharpened to effect the stone cutting; iron hinges made for the gates, &c.

2. *On northwest tower.*—The old copper roof on this building has been removed and replaced by a new one of the same material.

3. *Auxiliary work done.*—The mortar-mill, lime-house, and a mass of mortar have been removed from near the large magazine to near the proposed site of a new timber shed; 110 cubic yards of earth transferred from shops to road on the east front of the square; brick partition wall in carpenters' shop removed and the bricks cleaned; brick floors of smiths' shop taken up to place blast and water pipes of new forges and subsequently relaid; 275 superficial feet of stone cut, and 265 stone-cutters' tools sharpened therefor; oak timber underpinning, and 12 bolts therefor, for foundations of trip-hammer; apertures made in roof of smiths' shop for smoke stacks of new forges; 1084 superficial feet of stone cut, and 950 stone-cutters' tools sharpened therefor; 12 five feet long iron bolts made for stone foundation of steam-engine, and the stone and brick foundations of same laid; 24,000 brick laid in partitions in engine shop and in walls, flues, &c., of boiler; 3 doors and frames made for partition walls; large communication opening cut in partition wall between engine and filers' shops, and most of the bricks cleaned and re-laid in other work; communication door cut in partition wall between engine and carpenters' shops, &c.

4. *Repairs of buildings, tools, implements, &c.*—Extensive repairs of boundary fence, for which 1004 pounds spikes were extracted from decayed parts; walls of magazine for fixed ammunition repointed and yellow-washed; walls of arsenal, barrack, and line of shops also yellow-washed; 2 axes and 1 grubbing hoe repaired; wheels and body of wagon repainted, and 2 cart wheels newly tired; wheel, buckets, and other parts of apparatus for drawing water from the well repaired, renewed, &c.

5. *Other work done.*—Care and preservation of battery, small arms, tools, implements, &c.; 45 rifles issued to the militia; 2 boundary

corner stones cut and lettered; 192 cubic feet of stone received from quarry; 7,060 superficial feet of lumber received from mills, and 1,700 hauled; 19,460 bricks received from kilns; stores and lumber removed from shops to timber store; 2 wrenches and 6 cold chisels made; 6 pieces samples of North Carolina oak, hickory and pine timbers prepared and sent to Allegheny arsenal for experiment; care and grooming of 1 horse and 2 mules, and care and police of stable; police of public grounds; repairs and preservation of roads, walls, &c.; night and Sunday guard duty; office duties; supervision, superintendence, &c.

6. The following machinery, &c., has been purchased for this arsenal during the year:

1 steam engine, 30 horse power; 1 engine lathe.

1 engine lathe, 12′ shears; swing 26″.
2 engine lathes, 10′ shears; swing 20″.
1 chuck lathe, for wood turning.
1 26′ shears for wood turning.
1 spoke turning lathe.
3 drilling machines, vertical and horizontal.
1 milling and 1 dial machine.
1 shaping and 1 dovetailing machine.
1 punching and shearing machine.
1 fuze and sabot turning machine.
1 tire bending and stretching machine.
1 felloe and 1 bolt machine.
1 hub morticing machine.
1 power morticing machine.
1 foot morticing machine.
1 nave box setting machine.
1 tenoning machine.
2 planing and 1 wheel machine.
1 boxing, 1 boring, and 1 rifling machine.
1 fan blower; 12 cast iron furnaces.
1 circular saw and saw bench.
1 scroll saw.
2 atmospheric trip hammers.
1 hydraulic ram.
1 fire engine and 50 fire buckets.
1 hose cart and 500 feet of hose.

Together with a large extent of shafting, pulleys, belting, water and other pipe, &c. Of this machinery the furnaces and their attachments, fan blower, trip hammers, tire bending and stretching machines, and the steam engine (nearly) have been established in permanent position.

BATON ROUGE ARSENAL.

COMMANDED BY LIEUTENANT W. R. BOGGS.

The principal operations at this arsenal, during the year, have been as follows:

Articles fabricated.

189,000 cartridges for rifled arms.
3,800 pounds of bullets, calibre 58.
50 signal rockets.
38 canisters and 12 sabots.
2 stands for grape shot, and 12 straps for shells.
1,355 pounds of paint and putty.
1 gauge for elongated balls; 1 table.
167 packing boxes and chests, and 18 tin cans.
2 cases for artillery implements.

Other work done.

3,400 muskets and rifles, overhauled, cleaned, and oiled.
840 rifle ramrod heads altered.
72,000 flint-lock cartridges altered to percussion.
300 pounds laboratory paper varnished.
Fence put up on new south boundary of grounds.
Experiments made with Hale's rockets.
331 packages of ordnance stores received, and 495 issued.

CHARLESTON ARSENAL.

COMMANDED BY CAPTAIN J. GORGAS.

The operations at this arsenal, during the year, have been as follows:

Articles fabricated.

1 double bunk; 1 table; 2 hoes; 1 wheel-barrow.
96 6-pounder cartridge bags.
10 32-pounder tompions.

Other work done.

744 percussion muskets, cleaned, oiled, and repaired.
20 rifled muskets, cleaned, oiled, and repaired.
1 Hall's carbine, cleaned and restocked.
15 swords cleaned.
Wood-work on kitchen of quarters, completed and painted.
Barracks yellow-washed.
Gateway and roof of watchman's quarters, and other houses, repaired.

MOUNT VERNON ARSENAL.

COMMANDED BY CAPTAIN T. J. BRERETON.

(Temporarily by Brevet Second Lieutenant G. C. Strong.)

The principal operations at this arsenal, during the year, have been the following:

Articles fabricated.

31 6-pounder cartridges and cartridge bags.
2 sets of harness for wagon, two aud one horse.
1 saddle.
1 flat-boat, for use as ferry-boat.
12 axe-handles, 1 pail, 2 copper pans.
1 leveling staff, 1 screw driver, 2 watering pots.
2 wheel-barrows, 3 wood boxes, 3 cupboards.
10 wooden bunks, double.
1 tool-house.

Repaired.

18 muskets for State of Alabama.

Other work done.

45 cords wood, cut and hauled.
24 field carriages, cleaned and oiled.
All small arms at the post, inspected, cleaned, oiled, and repacked.
A brick yard and fixtures prepared, and 105,000 bricks moulded.

Doors, windows, and other wood-work of buildings, painted.
Fences painted, and cement washed.
One room in quarters No. 1 painted.
Roof built over reservoir, and reservoir painted.
Wash-house built, and bath-house repaired.
One frame house repaired.
Half an acre of ground cleared and fenced for a garden.
Two wells 44 feet, dug and curbed.
Lightning-rods erected on magazines and quarters.
1,200 feet of old iron water-pipe, between ram and reservoir, taken and new pipe put down.
1,200 feet of pipe laid to distribute water from the reservoir to quarters, barracks, stables, and garden.
Boundary lines of reserved land surveyed and marked.
710 lineal yards of osage orange hedge, planted.
300 cubic yards of soil hauled and spread.
29,000 feet of lumber hauled from saw mills to the arsenal; and public property at the post kept in repair.

H. K. CRAIG.
Colonel of Ordnance.

ORDNANCE OFFICE, *November* 1, 1858.

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